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THE EFFECT OF ISOKINETIC EXERCISE ON HUMAN HEART RATE AND BLOOD PRESSURE

by

© David J. Magee

A Thesis

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FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled The Effect of Isokinetic Exercise on Human Heart Rate and Blood Pressure submitted by David J. Magee in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Sport Sciences.

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Dedication

To Wendy and Shawn

ABSTRACT

The purpose of the study was to determine the effect of isokinetic exercise on heart rate and blood pressure at three different speeds of movement and to determine if an isokinetic interval program had a cumulative effect on heart rate and blood pressure. In addition, the quadriceps and hamstring muscle groups were tested isometrically on the Cybex II isokinetic apparatus. The effects of isometric exercise on heart rate and blood pressure were observed and compared with the results found in previous studies.

The data was analyzed using a one-way, two-way, and three-way analysis of variance on repeated measures, and Tukey and Scheffe Tests. Within the confines of the study, the null hypothesis was rejected at the .001 level of confidence for isokinetic exercise at all three speeds used - thirty degrees per second, ninety degrees per second, and 150 degrees per second.

The data showed that heart rate increased with both isometric and isokinetic exercise and the increase was larger for isokinetic exercise. Systolic and diastolic blood pressure rose with isometric exercise while systolic blood pressure rose and diastolic blood

pressure fell with isokinetic exercise. The increase in systolic blood pressure was greater with isokinetic exercise than with isometric exercise.

Modified tension time index, and pulse pressure were higher during isokinetic exercise than during isometric exercise. Mean blood pressure was higher during isometric exercise.

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CHAPTER I

INTRODUCTION

Traditionally, isometric and isotonic type of exercises have been used by individuals to improve muscle power and strength. In 1967 a new form of exercise was developed by J.J. Perrine and his associates. This new form of exercise was called isokinetic exercise. This original system, called the Cybex exerciser, was the first of several similar systems which used the principle of accommodating resistance (1).

Using the principle of accommodating resistance, isokinetic offers maximum resistance through a full range of motion. Isometric exercise offers maximum resistance but only at selected points in the range of motion as no movement occurs during this type of exercise. Isotonic exercise, on the other hand, allows full range of motion but gives maximum resistance only in the weakest parts of the range of motion (2,3,4). To offer accommodating resistance, the Cybex apparatus uses an electromechanical braking mechanism. Other isokinetic devices use hydraulic braking mechanisms (Orthotron) and a centrifugal brake arrangement (Mini-Gym).

Isokinetic exercise machines control the speed at which a joint moves through the range of motion. Some of these machines have only one speed, while others have a variable speed. The speed can be varied from zero degrees per second to 300 degrees per second depending on the device utilized.

With isokinetic exercise the muscle force transmitting capacity is accommodated through the full range of motion. The electromechanical braking mechanism of the Cybex exerciser, which is used in this study, acts as a governor to control the speed of the lever arm of the dynamometer. In so doing, the mechanism fluctuates with the changes in muscle tension and the skeletal leverage advantage by varying the load accordingly. The force of the muscles against the lever arm results in a resistance load on the lever arm which is the result of mechanical energy absorption. Thus, maximum resistance is offered only if maximum muscular tension is developed by the subject.

By watching the recorder showing the torque output on the Cybex machine, one is able to tell if the subject is exerting maximum effort. If the subject is exerting maximum effort, the torque curves will show an orderly decreasing progression in peak torque height. If the subject is not exerting maximum effort, the torque curves will show a more erratic tracing of peak torque heights (see Figure 1).

The Cybex II apparatus has several advantages. It is one of the few devices which can load a muscle maximally and still allow the limb to move through a full range of motion. In so doing, it works both the agonist and antagonist muscles around the joint. It provides a visual feedback system in the form of a dial on the dynamometer and a graphic recorder. Finally, it adjusts for pain and fatigue by its mechanism of accommodating resistance and by so doing prevents the joint being exercised from being overstressed.

Purpose of the Study

In reviewing the articles concerned with isokinetic exercise (2,3,5,6,7,8,10,11), there is a body of knowledge being developed as to the effect of isokinetic exercise on strength, power and endurance. Throughout the literature however, this is only one mention of the effect of isokinetic exercise on heart rate and blood pressure. David R. Lamb (12) in his book "Physiology of Exercise" has indicated that isokinetic exercise

(a) Peak Torque Heights with Maximum Effort

(b) Peak Torque Heights with Submaximal Effort

Figure 1: Peak Torque Heights with Maximal and Submaximal Effort

offered "some cardiac risk as opposed to isotonic exercise offering a 'slight' risk and isometric exercise offering a 'moderate' risk". When presenting this table, Lamb offered no references to support this obervation. There have been several articles concerned with the effect of isometric and/or isotonic exercise on heart rate and blood pressure (13,14,15,16,17,18,19,20,21,22, 23,24,25,26,27,28,29,30). As isokinetic exercise, in causing maximum contraction through a full range of motion of one group of muscles, causes maximum relaxation in the reciprocal muscles, the effect on heart rate and blood pressure may be different from isometric or isotonic exercise.

A review of the literature revealed that no standard rate of speed was used by authors in isokinetic exercise programs. The authors often differentiating their programs only into fast and slow speeds (2,5,6, 7,8,9,10,11,31,32).

Thus, the purpose of this study is two-fold:

(a) to determine the effect of isokinetic exercise on heart rate and blood pressure at three different speeds of movement, and;

(b) to determine if an isokinetic interval program has a cumulative effect on heart rate and blood pressure.

Delimitations

1. This study is limited to three speeds on the isokinetic apparatus (30 degrees per second; 90 degrees per second, and; 150 degrees per second).

2. The study is limited to exercising one set of reciprocal muscle groups (quadriceps-hamstrings) in the lower limb.

3. The study is limited to twenty-four (24) caucasian male subjects with no known cardiovascular problems (14).

4. The study is limited to subjects between the ages of 20 years and 35 years (33,34,35,36).

5. The study is performed on a Cybex II isokinetic apparatus manufactured by Lumex Corporation, Bay Shore, New York.

6. The examiner will verbally motivate the subjects if it appears from the tape readout on the isokinetic recorder that they are not exerting maximum effort.

7. Familiarization to the Cybex apparatus and the experimental procedure is limited to one practice session immediately prior to the first test for all subjects.

8. The blood pressure was recorded using a sphygomomanometer and stethoscope (37,38,39,40).

Definition of Terms

1. Diastolic Blood Pressure: pressure in the arteries during diastole or the period of dilatation of the heart. The average ausculatory value is 80-90 mm of mercury (34,36,38).

2. Heart Rate: the number of contractions of the ventricles of the heart per unit time.

3. Isokinetic Exercise: a muscular contraction with a shortening of the muscle length against an electro-mechanical braking system at a controlled speed of movement so that the resistance is accommodating to the maximum muscle force at each point in the range of motion.

4. Isokinetic Endurance: total work done in a specified time period calculated by summing the total peak torques.

5. Isometric Exercise: a muscular contraction with minimal muscle shortening and the joint exhibits no perceivable movement.

6. Korotkoff Sounds: sounds heard or recorded during ausculatory blood pressure determination when the

pressure in a blood pressure cuff is allowed to fall to zero from a pressure which is great enough to occlude circulation.

(a) the first sound heard (a clear tapping or thumping sound) indicates the passage of blood under the cuff and represents the systolic pressure.

(b) the moment the sounds disappear, the blood passes freely through the artery and represents the diastolic pressure. This is sometimes called the second diastolic pressure (34,41).

7. Mean Blood Pressure: the blood pressure calculated by taking two-thirds of the diastolic pressure plus one-third of the systolic pressure (42). It is an indication of the driving force required to drive the blood through the circulatory system.

8. Modified Tension Time Index (MTTI): an indication of the oxygen consumption of the heart (43,44,45,46). It is calculated using the following formula:

$$MTTI = \frac{\text{Heart Rate x Systolic Blood Pressure}}{100}$$

9. Peak Torque: the highest torque reading on the graph during each contraction.

10. Pulse Pressure: the numerical difference between the systolic and diastolic blood pressures.

11. Systolic Blood Pressure: pressure in the arteries during systole or the period of contraction of the heart. The average ausculatory value is 120-130 mm of mercury.

12. Torque: a force perpendicular to a lever arm which is rotating about an axes of rotation.

Basic Assumptions

This study proceeded on the following assumptions:

1. The subjects performed each test working maximally at all times.

2. The exercises performed were sufficiently strenuous to cause an effect on the cardiovascular system.

3. Under the conditions which the study was conducted, the changes which were noted, if any, were the result of the isokinetic exercise.

Hypothesis

The following null hypothesis was investigated:

If isokinetic exercise is performed during an interval program using the quadriceps and hamstring muscle groups on normal male subjects, there will be no significant change in the heart rate or blood pressure of the subjects during the exercise or after the exercise. Three speeds of isokinetic exercise were used (thirty degrees per second, ninety degrees per second, and 150 degrees per second).

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CHAPTER II

REVIEW OF LITERATURE

The review of literature is organized into four areas. Firstly are the general principles of isokinetic exercise; secondly are the effects of isotonic exercise on heart rate and blood pressure; thirdly are the effects of isometric exercise on heart rate and blood pressure; and finally, is the neurological control of circulation.

General Principles of Isokinetic Exercise

The original isokinetic exerciser was developed by J.J. Perrine and associates in 1967. Isokinetic exercise offers maximum resistance through a full range of motion. This is accomplished by controlling the speed of contraction. Depending on the apparatus used, this speed is either set by the manufacturer or can be adjusted by the operator of the device. This speed control provides voluntary concentric contractions which may be reciprocal depending on the apparatus used (1,2).

Acceleration and thus inertia only occurs until the predetermined speed of the apparatus is reached. Once the speed is reached, the force applied by the subject is converted to torque rather than acceleration. This torque is proportional to the magnitude of the muscular force and is exhibited on the dial of a dynamometer and on a recorder. It is this value of force output at a slow velocity of the muscle which is often referred to as strength, but in reality is a measurement of power in isokinetic tests (3,4,5,6,7,8).

The torque or strength measure is a product of the force which acts about an axis of rotation times the perpendicular distance from the axis of rotation. The torque value will vary through the range of motion due to the lever system of the human body and neuro-physiological factors. Thus, it is important to consider stabilization of the subject, joint alignment (centre of joint as close as possible to the axes of rotation), and, shaft length of the dynamometer when performing testing on an isokinetic apparatus (6,8,9, 10,11).

Peak torque or the maximum torque reading provides an easy reference when comparing the musculature across two joints. The peak torque is easy to note and when taken over time can provide an average peak torque to note any improvement. For example, Moffroid et al (8) state that a difference of greater than ten percent when testing the same muscles indicates a strength deficit in the weaker muscle.

In isokinetic terms, torque may also be considered work. Because the lever arm is kept constant for each subject, work, which is orce times distance, is the area under the torque curve. The work accomplished by the subject can be determined by the formula:

$$\text{WORK} = T \times 2 \times d,$$

where T is the torque in foot pounds and d is the portion of the arc travelled (1,2,5,8,11,12).

Power as demonstrated on the isokinetic apparatus is a mechanical measurement of work done per unit time. It is determined by the formula:

$$\text{POWER} = \frac{\text{Torque} \times 2 \times \text{revolutions per minute}}{\text{time (minutes)}}$$

It is this average power output during a given time frame which constitutes a definition of endurance in isokinetic terms (5,6,8,11,12).

When using isokinetic exercise for research and testing, one must be aware that a definite learning curve is present during the first few sessions. Thus it is important in studies where the torque values are of primary importance that each subject be given sufficient time to learn how to use the apparatus (7).

Moffroid et al. (8) have shown that using slow speed isokinetic exercise will increase torque values at slow velocities. Fast speed isokinetic exercise will increase torque values at all speed settings up to the fast speed but not to as high a torque value reading as was accomplished at the slow speed. Fast speed isokinetic exercise also increased the endurance of muscles exercised.

Reliability of isokinetic exercise was found to be high in terms of torque, range of motion and speed measurement provided certain conditions were met. A period of warm up and familiarization of the apparatus is required as well as proper stabilization and positioning of the apparatus. As well, the lever arm length must be constant for each subject. Reliability coefficients ranged from 0.93 to 0.99 (13,14,15,16).

Effect of Isotonic Exercise on Heart Rate and Blood Pressure

Tuttle and Horvath (17) found that when their subjects exercise on a bicycle ergometer at a work load of 1250 kilogram-meters for one minute, there was a rise in systolic blood pressure from 125 mm of mercury to 173 mm of mercury while the diastolic pressure remained virtually the same, fluctuating from 83 mm of mercury to 87 mm of mercury.

Lind and McNicol (18) found that rhythmic exercise caused an increase in heart rate as well as an increase in systolic blood pressure. At the same time, a decrease in the diastolic pressure was found. The authors felt that these effects resulted from a large increase in blood flow through the muscles during the period of intermittant relaxation which had the effect of delaying fatigue.

Kramer (19) found that with treadmill walking by elderly subjects, the heart rate increased gradually with the exercise value after one minute being significantly greater than the resting heart rate value. Kramer also found that the systolic pressure increased with exercise while diastolic pressure remained virtually the same.

Effect of Isometric Exercise on Heart Rate and Blood Pressure

Bartels et al. (20) found that heart rate increased with isometric exercise but did not reach a maximum value until immediately after the cessation of exercise. This was then followed by a drop in heart rate to resting levels, in some cases, within twenty seconds. At the same time, Bartels and his associates found that systolic blood pressure increased throughout the exercise bout (maximal arm and leg isometric contraction for ten seconds) reaching a maximum value immediately following exercise. In most cases, the systolic pressure returned to resting levels within two and a half minutes. Diastolic changes were found to be small and in most cases return to resting level within two minutes.

Kivowitz et al. (21) found that when subjects were asked to hold a dynamometer at 25% maximum voluntary contraction for five minutes, there was an increase in mean arterial pressure and heart rate. The authors felt this was suggestive of an increase in sympathetic tone predominating over baroreceptor-induced increase in vagal tone.

Lind and McNicol (18) found that heart rate and blood pressure changes were noted even during low contraction tensions such as 15 per cent maximum voluntary contraction. The authors felt that if sustained exercises were performed during rhythmic exercises, the reflex hemodynamic effects of the sustained contractions could be beneficial. Lind and McNicol stated that the blood flowing through the muscles performing the rhythmic exercise would be enhanced by the increase in perfusion pressure caused by the sustained contraction. The cardiac output during the isometric contractions tended to be higher than during isotonic exercise and the authors felt this would benefit the muscles performing rhythmic exercise.

In another study, Lind and McNicol (22) found that during isometric contraction of 5-10 percent maximum voluntary contraction, the heart rate and blood pressure both increased and reached a steady state when the contraction was held for three minutes. At tensions of 15-20-30 per cent maximum voluntary contraction, again the heart rate and blood pressure increased but a steady state was not reached. Donald et al. (23) reported similar data.

Thompson (24) found that isometric exercise resulted in an increase in both systolic and diastolic blood pressure while isotonic exercise caused an increase in systolic pressure only, while the diastolic pressure remained relatively constant. Thompson also found that the systolic blood pressure returned to near resting levels faster (within one minute) following isometric exercise while the diastolic pressure returned to resting levels within three to four minutes.

Hoel et al. (25) showed similar changes in hypertensive subjects. The hypertensive subjects did show a higher value for systolic and diastolic pressure than did the normotensive subjects, but these subjects also started with higher resting values.

Nagle (26) stated that one of the problems encountered with isometric exercise was that of breath holding or the valsalva manoeuver which is holding the breath and straining against a closed glottis. The valsalva manoeuver causes an acute rapid increase in blood pressure. The high intrathoracic pressure reduces venous return and the arterial pressure falls causing a reflex vasoconstriction of peripheral arterioles. Thus a pressure load can occur to the heart.

Other studies in the literature (27,28,29,30,31,32,33) have sho[illegible] similar results. The degree of blood pressu[illegible]on depends on the degree of isometric contrac[illegible]s the tension of the isometric contraction increase[illegible]e blood pressure elevation is more marked and occur[illegible]ore rapidly. During isometric contractions of 15 per [illegible]nt maximum voluntary contraction or less, the blood pres[illegible]ure elevation plus vasodilation of the muscle vascular tissues provides adequate blood flow to meet the metabolic needs of the contracting muscles. At contractions of greater than 15 per cent maximum voluntary contraction, the throttling effect of the mechanical compression caused by the contracting muscles results in inadequate blood flow to meet the metabolic requirements of the tissues (28). At contractions of 70 per cent maximum voluntary contraction, the intramuscular tension developed during the isometric exercise occludes the blood supply and leads to early fatigue.

Neurological Control of Circulation

In a working muscle, extra blood is needed to ensure its proper functioning. The resultant vasodilation in the working muscle is primarily due to the release of vasoconstrictor tone rather than by activity of vasodilator fibers although these cholinergic fibers do play a part. The peripheral vasoconstriction is mediated by the x-adrenorgic receptors of the peripheral autonomic nervous system (34,35,36,37,38).

Alterations in blood pressure are the result of a reflex response of pressoreceptors and chemoreceptors. As the blood pressure increases, these receptors increase their frequency of firing. These receptors located in the carotid sinus travel to the brain stimulating the central and autonomic nervous systems. This stimulation reduces the effect of the arterial baroreceptors reflex and the result is a rise in both heart rate and blood pressure (39,40,41,42).

The heart rate increase seen with exercise is initiated by the release of vagal tone followed by sympathetic stimulation of the heart. The central control of the heart rate during exercise depends on several factors. The impulses from receptors in joints and the working muscles are received by the brain in proportion to the rate and amount of work performed. Cardio-accelerator reflexes in the carotid and aortic bodies reacting to chemical stimulation can increase the heart rate. Finally, depressor reflexes from the receptors in the carotid sinus and aortic arch can depress the vagal control over the heart enabling the heart to beat faster (43,44,45).

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CHAPTER III

METHODS AND PROCEDURES

Sample Selection

The sample consisted of twenty-four male caucasian volunteer subjects between the ages of twenty-one years and thirty-five years. The program involved one exercise session of isometric exercise followed by three exercise sessions of isokinetic exercise (1,2,3,4,5,6, 7,8). The subjects had no known cardiac, pulmonary or blood pressure problems as determined by a medical questionnaire (9,10,11). Subjects were instructed to refrain from smoking, eating, drinking or exercising for at least four hours prior to each test session (12,13, 14).

Apparatus

The isokinetic apparatus used in the study was the Cybex II system manufactured by the Lumex Corporation. The concept of isokinetic exercise has been discussed previously in Chapter I (page 1-3).

The Cybex II isokinetic system consisted of three components:

1. A dynamometer which measures torque inputs up to 360 foot-pounds. The input attachment supplies a resistance which automatically varies to accommodate the force applied by the subject. Any force applied to the input shaft is recorded on a recorder as well as being displayed on a dial on the front of the dynamometer. The force is recorded as torque in foot-pound units.
2. A speed selector which presets the speed of rotation of the dynamometer from zero to 300 degrees per second (zero to fifty revolutions per minute). The lever arm of the dynamometer cannot be accelerated beyond the set speed regardless of the input torque applied. As more force is exerted against the lever arm of the dynamometer, more resistance is encountered by the subject's limb.
3. A two speed recorder (two millimeters per second and fifty millimeters per second) with heated stylus, records and displays a permanent record of the applied torque.

The recorder of the Cybex apparatus was connected to a Hewlett Packard four channel recorder (model 7754A) by means of a Hewlett Packard bioelectric amplifier (model 8811A) so that the heart rate and torque readings could be recorded simultaneously.

The Cybex II Isokinetic System as used and connected to the four channel recorder is shown in Figure 2. Figure 3 illustrates the permanent record of torque output (channel one), heart rate (Channel two), and heart beats (Channel four) on the paper of the four channel recorder.

Blood pressure measurements were made on a Medisco mercurial sphygmomanometer manufactured in West Germany (Figure 4). The adult blood pressure cuff was placed around the middle third of the upper arm at the level of the heart, evenly and snugly, without constriction. The sphygmomanometer blood pressure cuff was inflated to about 200 millimeters of mercury and the pressure was released at a rate of reduction of about two to three millimeters of mercury per second (15,16,17,18,19,20, 21,22,23).

The sphygmomanometer provided an indirect ausculatory measurement of systolic and diastolic pressure. A review of the literature indicated that the ausculatory method was accurate if performed by the same individual (24,25,26,27). Although the blood pressure readings, when taken by the ausculatory method, were slightly higher than they would have been if taken by the direct method, the ausculatory method was used as it presented less danger to the subjects.

Figure 2: Isokinetic Apparatus

(a) Cybex II Isokinetic Apparatus, Hewlett Packard Four Channel Recorder and Timer

Figure 2: Isokinetic Apparatus

(b) Dynamometer of Isokinetic Apparatus

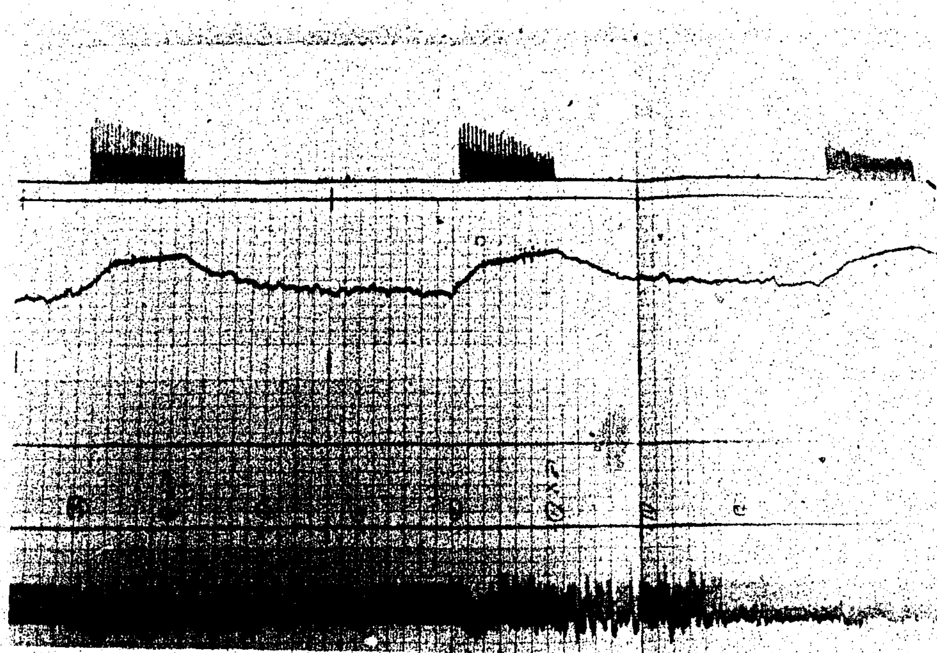

Figure 3: Recording on Four Channel Recorder. Top Recording is torque output (channel one); Second Recording is heart rate (channel two); and Bottom Recording is heart beat (channel four).

Figure 4: Me[illegible]sco Mercurial Sphygmomanometer

The first (systolic pressure) and fifth (diastolic pressure) Korotkoff sounds were noted by ausculation of the brachial artery in the anti-cubital fossa.

Heart rate measurements were made on the Hewlett Packard four channel recorder. The electrodes were placed on each subject as shown in Figure 5. The multi-channel lead was attached to a Hewlett Packard bio-electric amplifier (model 8811A) which gave the heart beat reading on channel four. The bioelectric amplifier was attached to a Hewlett Packard rate computer (model 8812A) which gave the heart rate on channel two (Figures 6 and 7).

Initial Familiarization

The twenty-four male subjects came to the strength laboratory in the Faculty of Rehabilitation Medicine, where they were placed in the isokinetic apparatus as shown in Figure 8. The investigator explained the isokinetic principle of maximum resistance through a rull range of motion to the subjects. The investigator then fully explained the experimental procedure to the subjects who were asked to complete a personal data form and to sign an informed consent form (Appendix B and C). The subjects were given an opportunity to prac-

Figure 5: Electrode placement for Recording Heart Rate

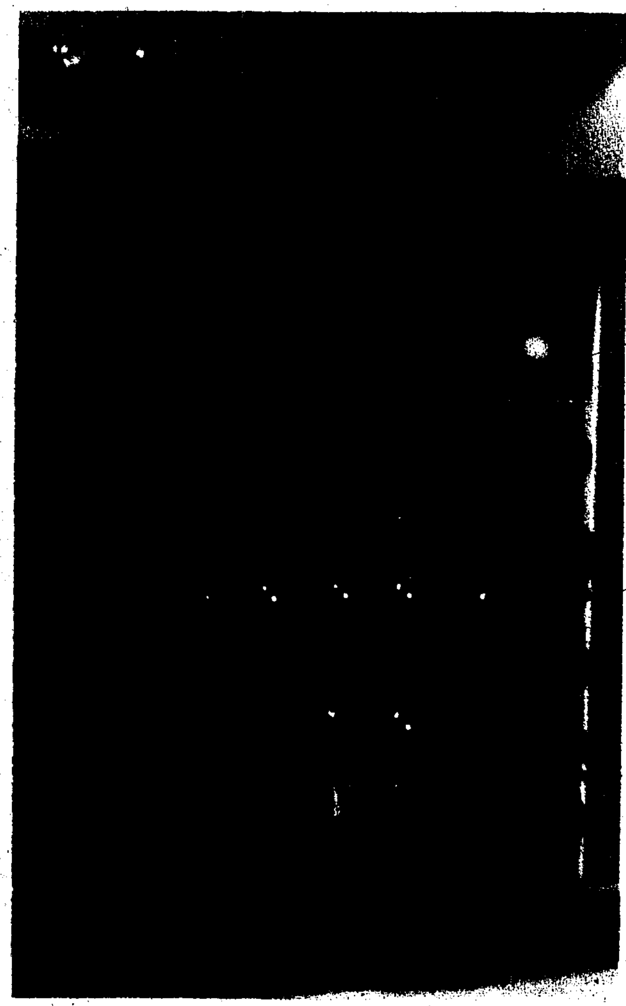

Figure 6: Four Channel Recorder Showing Bioelectric Amplifiers and Rate Computer

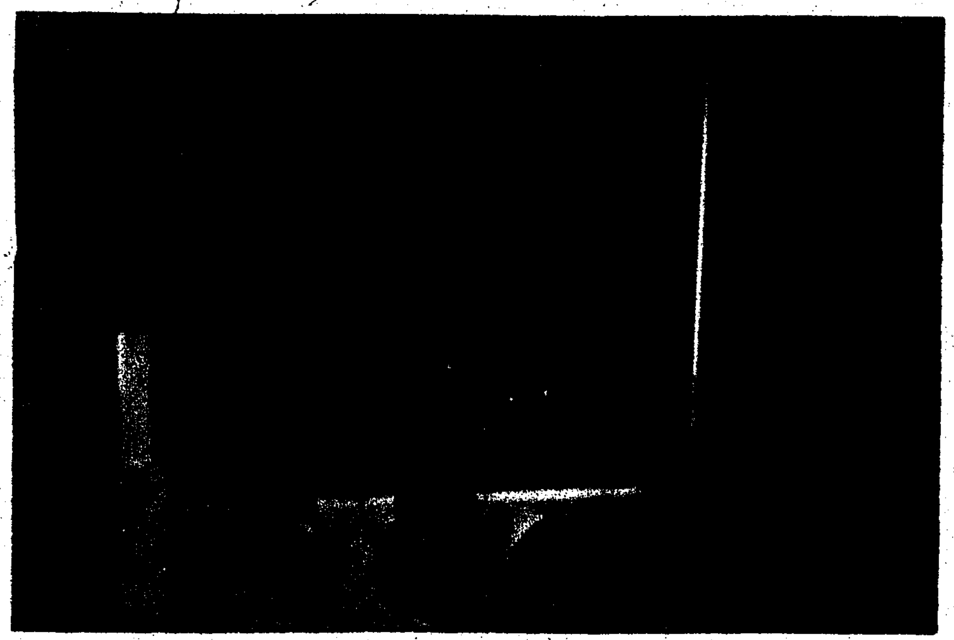

Figure 7: Connection Between Bioelectric Amplifier and Rate Computer to Record Heart Rate

Figure 8: Subject Placement in Isokinetic Apparatus

tise using the dynamometer at the speeds selected for the project.

Isometric Testing Procedure

Following familiarization of the isokinetic dynamometer, the subject was allowed a rest period of ten minutes. During the first five minutes, the blood pressure cuff and electrocardiogram leads were attached to the subject.

Each subject's left arm rested at their side on a supporting cushion. The adult size blood pressure cuff was placed around the middle third of the upper arm.

The subjects were then seated in the test apparatus and attached to the dynamometer apparatus as shown in Figure 8. The input shaft of the dynamometer was placed lateral to the subject's knee with its axis of rotation coinciding as closely as possible with the axis of rotation of the knee joint (28,29). Each subject was held in position by straps around the waist, the thigh, and the right leg proximal to the ankle. This latter strap attached the subject to the isokinetic apparatus. The position of the back rest of the isokinetic table was adjusted so that the hip angle is between 110 degrees and 120 degrees (30).

Once positioned in the isokinetic apparatus, each subject was allowed to perform five or six contractions in each direction to allow him to get set and comfortable in the apparatus.

Each subject was then allowed a five minute rest period to allow the heart rate and blood pressure to stabilize near resting levels. During this period the heart rate and blood pressure were recorded every minute. The heart rate was recorded on the minute and the blood pressure cuff was inflated five seconds prior to the minute. The timing of the heart rate and blood pressure measurements was by means of a Gra-Lab Timer (model 171).

While the subject was resting, the angle of the right knee was set at sixty degrees of flexion (full extension considered zero degrees) to prepare for the isometric extensor test. This angle has been found to be the angle which demonstrates the highest isometric force for the knee extensors (31,32,33). To do the isometric test, the angle of the leg was set and the speed selector was set at zero degrees per second.

Following the ten minute rest, the subject was asked to perform one maximum voluntary contraction (MVC) of the quadriceps muscles of the right leg and was asked to hold the contraction as long as possible. The heart rate and blood pressure were recorded every minute during the contraction.

Following the MVC, each subject was allowed a five minute rest period with heart rate and blood pressure being recorded every minute. During this rest period, the investigator determined seventy percent MVC, thirty percent MVC and ten percent MVC (17, 34,35,36,37,38) (Appendix G).

Following this rest period, each subject was asked to perform one of the percentage MVC of the quadriceps of the right leg. They were asked to hold the contraction for as long as possible to a maximum of three minutes. The percentage MVC was assigned according to a Latin Square design (Appendix K). The heart rate and the blood pressure were noted every minute. Each subject was then allowed another five minute rest period (39).

This procedure was repeated for the other two percentage maximum voluntary contractions (70%, 30% or 10%) to a maximum contraction time of three minutes for each session.

Following completion of the three percentage MVC's for the quadriceps, each subject was given a ten minute rest, five minutes of which could be used to move about, and a second five minutes during which the heart rate and blood pressure were recorded in the sitting position.

During the second five minute rest, the angle of the right knee was set at forty-five degrees of flexion to prepare for the isometric flexor test. This angle has been found to be the angle which demonstrates the highest isometric force for the knee flexors (31,32, 33). As previously described, the speed selector is set at zero degrees per second for the isometric contraction.

Following the ten minute rest period, each subject was asked to perform one MVC of the hamstrings of the right leg and was asked to hold the contraction as long as possible to a maximum of three minutes. The heart rate and the blood pressure were recorded every minute.

Following the MVC, each subject was allowed another five minute rest period with heart rate and blood pressure being recorded every minute. During this period, the investigator determined 70%, 30% and 10% MVC (Appendix G). For the following three tests, these percentage maximum voluntary contractions were assigned for each subject to do according to the Latin Square design as indicated for the quadriceps muscle group (Appendix K).

Following the second five minute rest, each subject was asked to perform one of the three percentage maximum voluntary contractions of the hamstrings of the right leg and was asked to hold the contraction as long as possible to a maximum of three minutes. The heart rate and blood pressure were recorded every minute. Each subject was then allowed another five minute rest period during which the heart rate and blood pressure were recorded.

This procedure was repeated for the other two percentage maximum voluntary contractions of the hamstrings as was done with the quadriceps muscle. The time frame for the isometric sessions is illustrated in Figure 9.

Isokinetic Interval Testing Procedure

During the subsequent three visits to the strength laboratory, each subject was asked to perform an isokinetic interval program at three assigned speeds set on the speed selector of the isokinetic apparatus. The three speeds were thirty degrees per second, ninety degrees per second, and 150 degrees per second. The speeds were assigned according to a Latin Square design (Appendix K).

The program for each speed of the Cybex isokinetic dynamometer was the same, only the dynamometer speeds were changed. Each subject did the three isokinetic sessions and the isometric session at the same time of

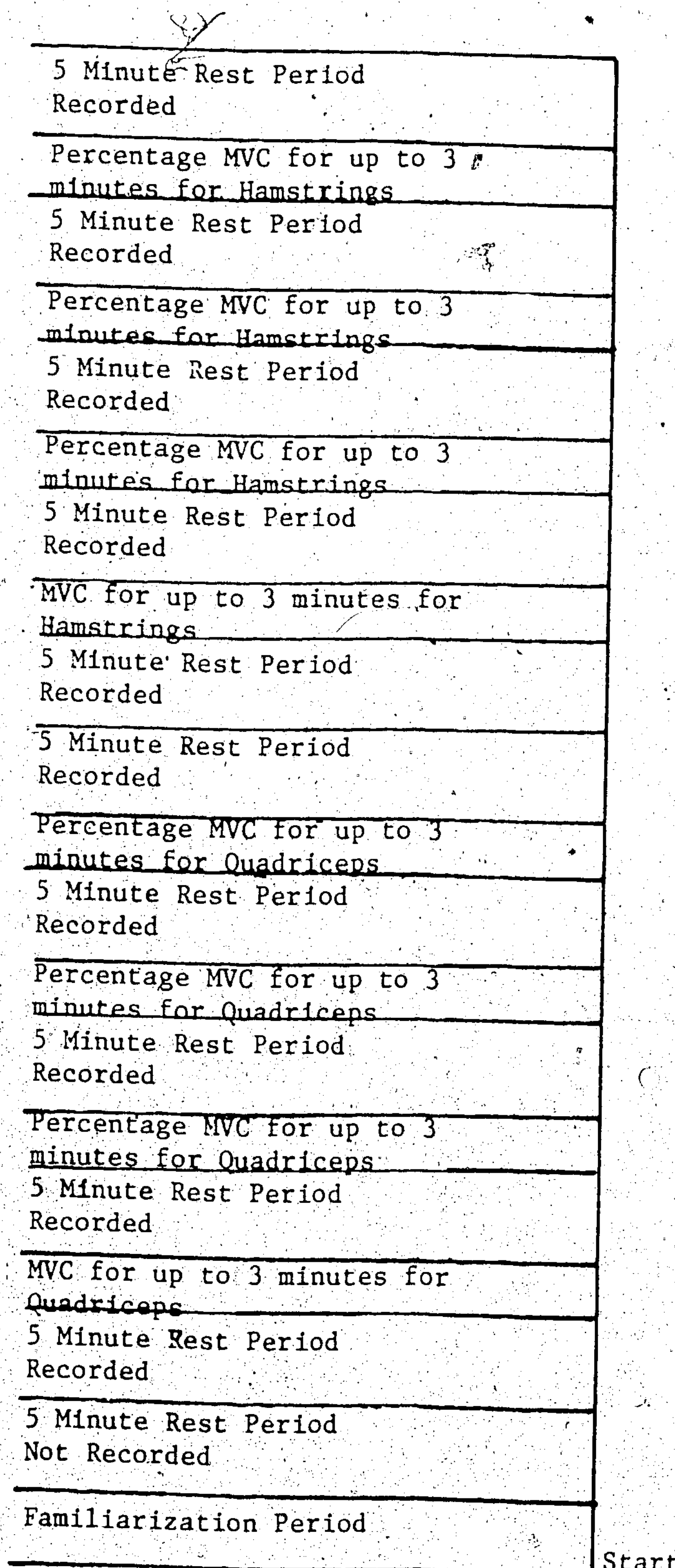

Figure 9: Time Frame for Isometric Sessions
Total Time: 75 Minutes

day but on different days (40).

Each subject was positioned as previously described for the isometric test (Figure 8), and the electrocardiograph electrodes and blood pressure cuff were positioned as previously described.

Once positioned in the isokinetic apparatus, each subject was allowed to perform five or six contractions at the selected speed in each direction (flexion and extension of the knee) through a full range of motion to allow the subject to become comfortable and adjusted in the apparatus.

Each subject was then allowed a five minute rest period to allow the heart rate and blood pressure to stabilize at a normal resting level. During this period the heart rate and blood pressure was recorded every minute. The heart rate was recorded on the minute and the blood pressure cuff was inflated five seconds prior to the minute.

Following the five minute rest period, each subject was asked to flex and extend his right knee through a full range of motion as hard and as fast as he could for one minute at one of the designated speeds. The subject was then allowed a three minute rest-relief period (41). The heart rate and blood pressure were recorded every minute during the rest period and contraction time.

The process of work and rest-relief were continued for a total of three sets (41). Following completion of the third set, heart rate and blood pressure were recorded until both returned to near pre-exercise levels.

On the subsequent two visits, the program was the same as described above, but with different dynamometer speeds. The time frame for the Isokinetic Interval training sessions is illustrated in Figure 10.

Statistical Treatment

One-way, two-way and three-way analyses of variance with repeated measures on one factor were used to analyse the data. These methods are described in Winer (42). These methods offer the advantage of each subject acting as his own control. Thus the variability due to average different responses of all subjects is eliminated from the experimental error.

The data was tested at the .01 level of significance for the analysis of variance as well as for the Tukey Test and Scheffe Test.

Rest Period recorded until values return to resting level (maximum anticipated: 10 minutes)

Isokinetic Exercise for 1 Minute

3 Minute Rest Period Recorded

Isokinetic Exercise for 1 Minute

3 Minute Rest Period Recorded

Isokinetic Exercise for 1 Minute

5 Minute Rest Period Recorded

5 Minute Rest Period Not Recorded

Start

Figure 10: Time Frame for Isokinetic Interval Training
Total Time/Session: 30 Minutes

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CHAPTER IV

RESULTS

The purpose of this study was to determine the effect of isokinetic exercise on heart rate and blood pressure at three different speeds of movement and to determine if an isokinetic interval program had a cumulative effect on heart rate and blood pressure. In addition, the quadriceps and hamstring muscle groups were tested isometrically on the Cybex II isokinetic apparatus. The effects of isometric exercise on heart rate and blood pressure were observed and compared with the results found in previous studies. A sample of twenty-four subjects was studied.

The results and discussion will be divided into three parts as follows (a) effect of isometric exercise on heart rate and blood pressure; (b) effect of isokinetic exercise on heart rate and blood pressure and; (c) comparison of the effect of isometric and isokinetic exercise on heart rate and blood pressure. The raw data and format statements for each procedure are found in appendices L and M respectively.

Effect of Isometric Exercise on Heart Rate and Blood Pressure

The method used for the statistical analysis of the data for heart rate during isometric rest periods was a two-way analysis of variance on repeated measures. In the analysis, the terms groups and trials refer to the following: (1) Group - in the testing of isometric exercise, there were five rest periods. The first rest period was pre-exercise or pre-maximum voluntary contraction. The second, third, and fourth rest periods were pre-seventy percent, pre-thirty percent and pre-ten percent respectively. The final rest period was the post-test reading. (2) Trials refers to the five readings for each subject within each group. That is, each subject had five resting values for each of the rest periods.

Table I shows the values obtained in the two-way analysis of variance for heart rate using quadriceps and hamstring muscle groups. Significant interaction occurred between each of the groups over the five trials with no pattern emerging. Primary interaction was between the post-test values.

The method used for the statistical analysis of the data for systolic and diastolic blood pressure during isometric rest periods was a two-way analysis of variance on repeated measures. In the analysis, the terms groups and trials refer to the same terms as used in the analysis of heart rate data for isometric rest periods.

Table I

Analysis of Variance for Heart Rate During Isometric Rest Periods for (1) Quadriceps and (2) Hamstring Muscle Groups

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
1. Quadriceps					
GROUPS	634.500	4.	158.625	0.256	0.906
	71357.000	115.	620.496		
TRIALS	2101.501	4.	525.375	12.190	0.001
GROUPS/TRIALS INTERACTION	4765.500	16.	297.844	6.911	0.001
	19825.000	460.	43.098		
2. Hamstrings					
GROUPS	571.500	4.	142.875	0.272	0.896
	60425.000	115.	525.435		
TRIALS	2799.002	4.	699.750	16.477	0.001
GROUPS/TRIALS INTERACTION	2809.502	16.	175.594	4.135	0.001
	19536.000	460.	42.470		

Table II shows the values obtained in the two-way analysis of variance for systolic and diastolic blood pressure using quadriceps and hamstring muscle groups. Significant interaction for systolic blood pressure occurred primarily between the pre-test value and the first post-test value. As well, for trials three, four, and five, interaction did occur between the post-test values for the quadriceps muscle group. For the hamstrings muscle group, the interaction for systolic blood pressure was between the pre-exercise value and the post-exercise values.

The method used for the statistical analysis of the data for mean blood pressure, modified tension time index, and pulse pressure during isometric rest periods using quadriceps and hamstring muscle groups was a one-way analysis of variance on repeated measures. In the analysis, the term trials refers to the rest periods.

Table III shows the values obtained in the one-way analysis of variance for mean blood pressure, modified tension time index and pulse pressure for quadriceps and hamstrings muscle groups.

A Tukey Test performed on the trials for mean blood pressure, modified tension time index, and pulse pressure during isometric rest periods showed a

Table II

Analysis of Variance for (a) Systolic Blood Pressure and (b) Diastolic Blood Pressure During Isometric Rest Periods Using (1) Quadriceps and (2) Hamstring Muscle Groups

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
1. Quadriceps					
(a) Systolic Blood Pressure					
GROUPS	4489.500	4.	1122.375	2.133	0.081
	60500.000	115.	526.087		
TRIALS	2517.001	4.	629.250	46.128	0.001
GROUPS/TRIALS INTERACTION	1243.501	16.	77.719	5.697	0.001
	6275.000	460.	13.641		
(b) Diastolic Blood Pressure					
GROUPS	454.500	4.	113.625	0.312	0.869
	41842.000	115.	363.843		
TRIALS	99.000	4.	24.750	1.970	0.098
GROUPS/TRIALS INTERACTION	277.500	16.	17.344	1.381	0.146
	5779.000	460.	12.563		

Table II continued

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
2. Hamstrings					
(a) Systolic Blood Pressure					
GROUPS	1609.501	4.	402.375	0.907	0.463
	51028.000	115.	443.722		
TRIALS	1639.501	4.	409.875	32.773	0.001
GROUPS/TRIALS INTERACTION	618.000	16.	38.625	3.088	0.001
	5753.000	460.	12.507		
(b) Diastolic Blood Pressure					
GROUPS	208.500	4.	52.125	0.141	0.967
	42548.000	115.	369.982		
TRIALS	18.000	4.	4.500	0.388	0.817
GROUPS/TRIALS INTERACTION	208.500	16.	13.031	1.125	0.329
	5329.000	460.	11.585		

Table III

Analysis of Variance for (a) Mean Blood Pressure, (b) Modified Tension Time Index, and (c) Pulse Pressure During Isometric Rest Periods Using (1) Quadriceps and (2) Hamstring Muscle Groups

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
1. Quadriceps					
(a) Mean Blood Pressure					
	39711.000	119.	33.706		
TRIALS	371.250	4.	92.813	11.075	0.001
	3989.000	476.	8.380		
(b) Modified Tension Time Index					
	129327.000	119.	1086.781		
TRIALS	5980.781	4.	1495.195	16.087	0.001
	42347.000	476.	88.964		
(c) Pulse Pressure					
	45937.000	119.	386.027		
TRIALS	2280.000	4.	570.000	24.565	0.001
	11044.938	476.	23.204		

Table III continued

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
2. Hamstrings					
(a) Mean Blood Pressure					
	36839.000	119.	309.571		
TRIALS	190.781	4.	47.695	6.636	0.001
	3421.000	476.	7.187		
(b) Modified Tension Time Index					
	96552.000	119.	811.361		
TRIALS	4498.125	4.	1124.531	13.920	0.001
	38454.000	476.	80.786		
(c) Pulse Pressure					
	41063.750	119.	345.073		
TRIALS	1655.625	4.	413.906	18.680	0.001
	10547.063	476.	22.158		

significant difference occurred between those trials shown in Table IV. The differences in mean blood pressure, modified tension time index and pulse pressure for quadriceps and hamstring muscle groups are shown in Figures 11, 12, and 13, respectively.

As indicated in Figure 11, the pre-exercise mean blood pressure value for the quadriceps muscle group was found to be significantly different from the post-exercise values. Furthermore, no significant differences were found among the post-exercise mean blood pressure values. For the hamstring muscle group, the pre-exercise mean blood pressure value was found to be significantly different from the last three post-exercise mean blood pressure values. No significant differences were found between the post-exercise mean blood pressure values for the hamstrings muscle group.

The pre-exercise modified tension time index value for the quadriceps muscle group was found to be significantly different from the following three post-exercise values. The pre-exercise value was not significantly different from the final post-test value. The third and fourth post-exercise modified tension time indices were significantly different from the final

Table IV

Significant Differences Between Trials Using Tukey Test* for Mean Blood Pressure, Modified Tension Time Index, and Pulse Pressure During Isometric Rest Periods Using Quadriceps and Hamstring Muscle Groups

QUADRICEPS	HAMSTRINGS
(a) Mean Blood Pressure	(a) Mean Blood Pressure
98.196 - 96.756	97.022 - 95.857
98.196 - 95.998	97.022 - 95.352
98.196 - 96.195	97.002 - 95.687
98.196 - 96.375	
*critical value = 1.22 @ α = .01	*critical value = 1.13 @ α = .01
(b) Modified Tension Time Index	(b) Modified Tension Time Index
89.493 - 84.768	83.460 - 79.423
89.493 - 81.533	83.460 - 79.694
89.493 - 80.983	83.460 - 77.470
81.533 - 86.441	79.423 - 84.844
80.983 - 86.441	79.694 - 84.844
*critical difference = 3.96 @ α = .01	*critical value = 3.77 @ α = .01
(c) Pulse Pressure	(c) Pulse Pressure
44.133 - 41.408	41.008 - 37.992
44.133 - 40.633	41.008 - 37.558
44.133 - 39.025	41.008 - 36.842
44.133 - 38.717	41.008 - 36.200
41.408 - 39.025	
41.408 - 38.717	
*critical value = 2.02 @ α = .01	*critical value = 1.98 @ α = .01

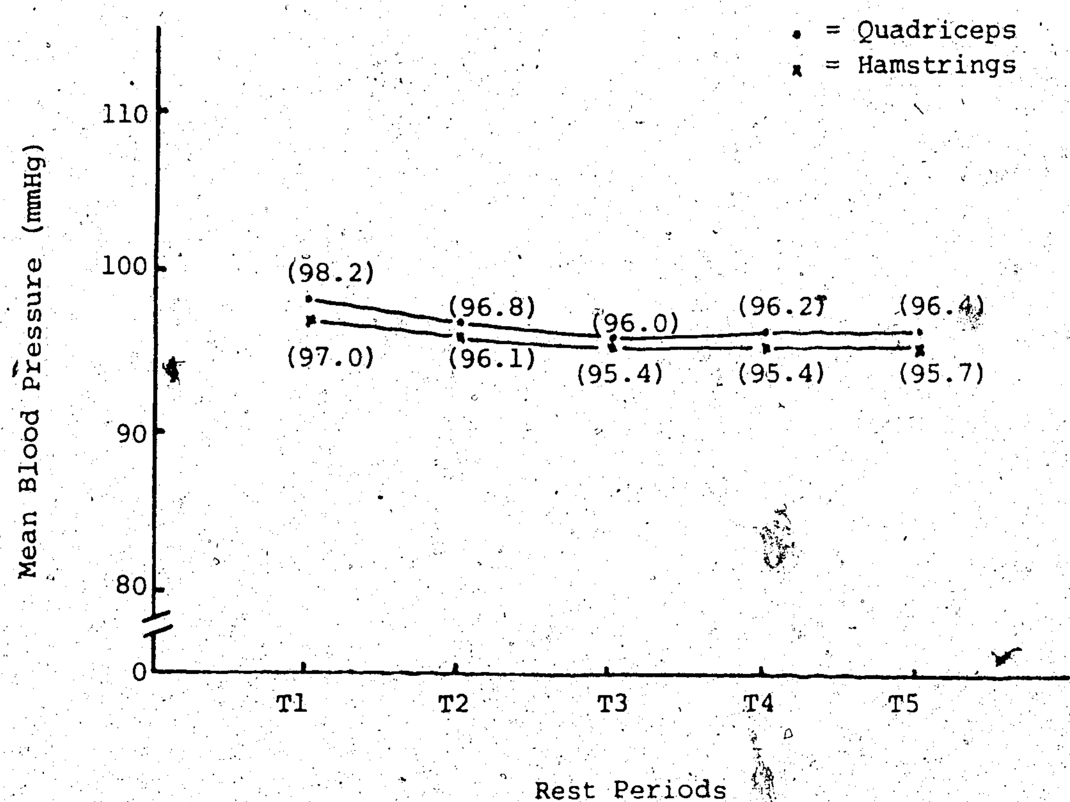

Figure 11: Mean Blood Pressure During Isometric Rest Periods Using Quadriceps and Hamstring Muscle Groups

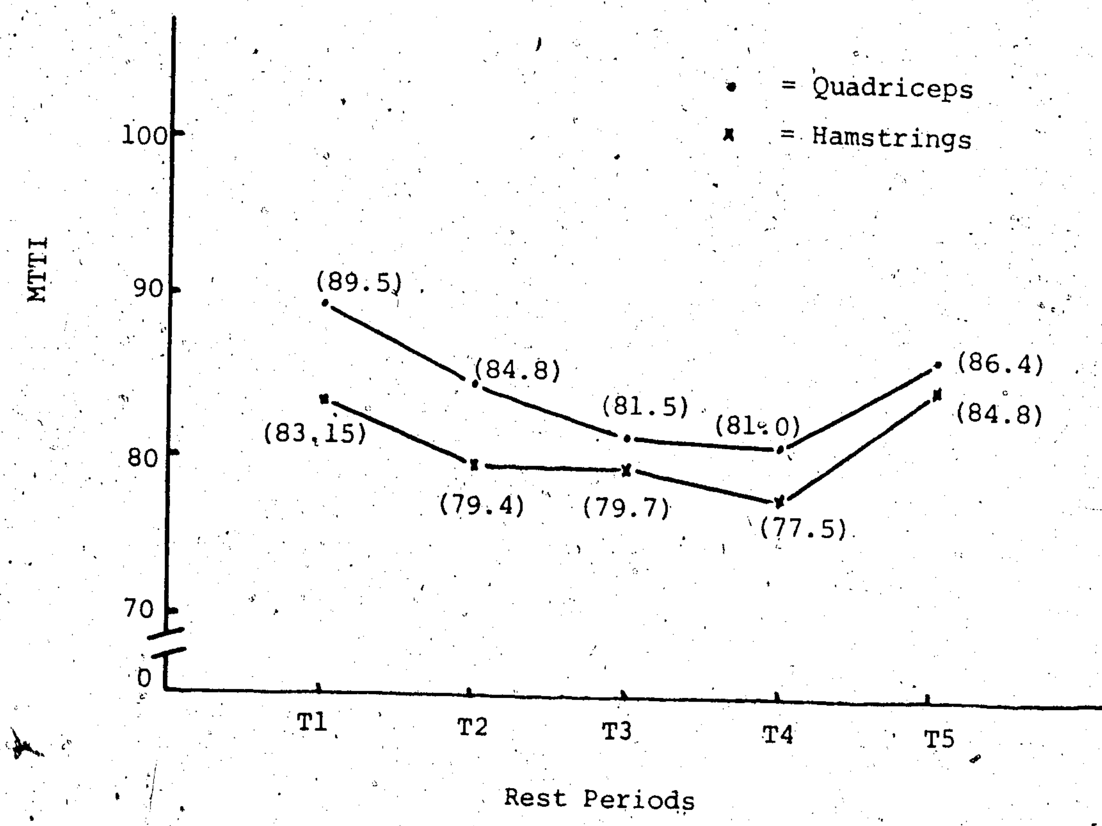

Figure 12: Modified Tension Time Index During Isometric Rest Periods Using Quadriceps and Hamstring Muscle Groups

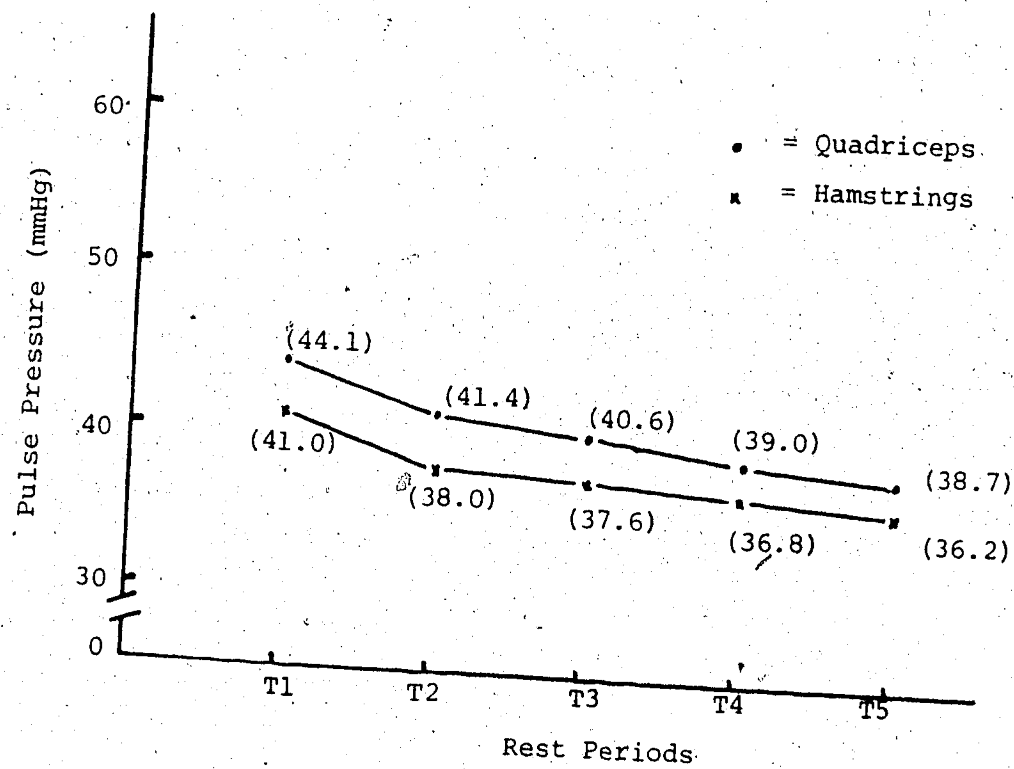

Figure 13: Pulse Pressure During Isometric Rest Periods Using Quadriceps and Hamstring Muscle Groups

post-exercise values. Similarly, the pre-exercise modified tension time index for the hamstring muscle group was found to be significantly different from the following three post-exercise values. Again, the pre-exercise modified tension time index was not significantly different from the final post-exercise value. The second and third post-exercise modified tension time indices were significantly different from the final post-exercise value.

As indicated in Figure 13, the pre-exercise pulse pressure for the quadriceps muscle group was found to be significantly different from the post-exercise values. As well, the first post-exercise value was found to be significantly different from the final three post-exercise values. There were no significant differences between the final three post-exercise values. For the hamstring muscle group, the pre-exercise pulse pressure was significantly different from the post-exercise values. There were no significant differences between the post-exercise pulse pressure values.

The method used for the statistical analysis of the data for heart rate during isometric exercise using the quadriceps and hamstrings was a one-way analysis of variance on repeated measures. In the analysis, the term treatment refers to the percentage strength of the isometric contraction. Trial one is maximum voluntary contraction (MVC); trial two is seventy percent MVC; trial three is thirty percent MVC; and, trial four is ten percent MVC.

Table V shows the values obtained in the one-way analysis of variance for heart rate during isometric exercise bouts using quadriceps and hamstrings.

A Tukey Test performed on the trials for the heart rate during isometric exercise bouts showed a significant difference occurred between those trials shown in Table VI.

As indicated in Figure 14, for the quadriceps muscle group, there were significant differences in heart rate between MVC, and thirty and ten percent MVC; between seventy percent MVC, and thirty and ten percent MVC, and; between thirty percent MVC and ten percent MVC. For the hamstring muscle groups, there were significant differences in heart rate between MVC, and seventy, thirty, and ten percent MVC, and between seventy percent MVC and, thirty and ten percent MVC.

The method used for the statistical analysis of the data for systolic and diastolic blood pressure during isometric exercise bouts using quadriceps and hamstring muscle groups was a one-way analysis of variance

Table V

Analysis of Variance for Heart Rate During Isometric Exercise Bouts using (1) Quadriceps and (2) Hamstring Muscle Groups

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
1. Quadriceps					
	21641.688	23.	940.943		
TREATMENT	42543.375	3.	14181.125	93.963	0.001
	10413.688	69.	150.923		
2. Hamstrings					
	15599.375	23.	678.234		
TREATMENT	36083.438	3.	12027.813	71.405	0.001
	11622.625	69.	168.444		

Table VI

Significant Differences Between Treatments Using Tukey Test* for Heart Rate During Isometric Exercise Bouts Using Quadriceps and Hamstring Muscle Groups

QUADRICEPS	HAMSTRINGS
120.208 - 85.000	114.917 - 101.625
120.208 - 69.208	114.917 - 73.917
114.833 - 85.000	114.917 - 67.875
114.833 - 69.208	101.625 - 73.917
85.000 - 69.208	101.625 - 67.875
*critical value = 11.51 @ α = .01	*critical value = 12.16 @ α = .01

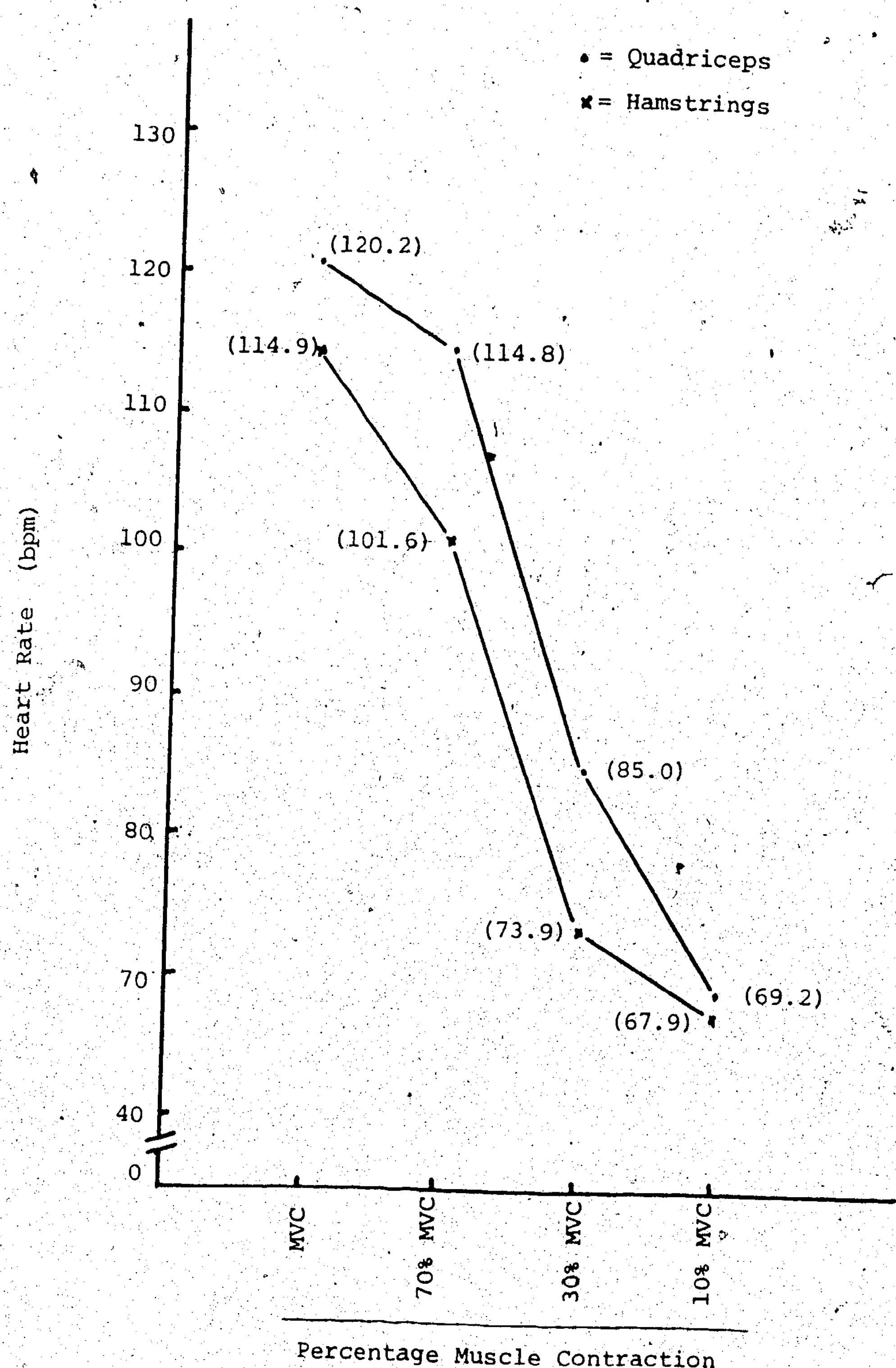

Figure 14: Heart Rate During Isometric Exercise Bouts Using Quadriceps and Hamstring Muscle Groups (MVC = maximum voluntary contraction)

on repeated measures. In the analysis, the term rest refers to the percentage strength of isometric contraction as the term treatment previously did in isometric exercise heart rate.

Table VII shows the values obtained in the one-way analysis of variance for systolic and diastolic blood pressure for quadriceps and hamstrings muscle groups.

A Tukey Test performed on the trials for systolic and diastolic blood pressure during isometric exercise bouts showed a significant difference occurred between those trials shown in Table VIII.

As indicated in Figure 15, for the quadriceps muscle group, there were significant differences in the systolic blood pressure between MVC, and thirty and ten percent MVC, and between seventy percent MVC and thirty and ten percent MVC. For diastolic blood pressure, the quadriceps muscle group showed significant differences between MVC, and thirty and ten percent MVC; between seventy percent MVC, and thirty and ten percent MVC; and, between thirty percent MVC and ten percent MVC.

For the hamstring muscle group, there were significant differences in the systolic blood pressure between MVC and seventy, thirty, and ten percent MVC; between seventy percent MVC, and thirty and ten percent

Table VII

Analysis of Variance for (a) Systolic Blood Pressure and (b) Diastolic Blood Pressure During Isometric Exercise Bouts Using (1) Quadriceps and (2) Hamstring Muscle Groups

SOURCE	SUM OF SQUARES	DEGREES OF FREEDON	MEAN SQUARES	F RATIO	PROBABILITY
1. Quadriceps					
(a) Systolic					
	13538.000	23.	588.609		
REST	13764.000	3.	4588.000		
(Treatment)	7724.000	69.	111.942	40.986	0.001
(b) Diastolic					
	4404.438	23.	239.323		
REST	9848.813	3.	3282.938		
(Treatment)	5452.563	69.	79.023	41.544	0.001
2. Hamstrings					
(a) Systolic					
	9173.000	23.	398.826		
REST	17487.000	3.	5829.000		
(Treatment)	5175.000	69.	75.000	77.720	0.001
(b) Diastolic					
	5697.938	23.	247.736		
REST	14813.063	23.	4937.688		
(Treatment)	4443.063	69.	64.392	76.681	0.001

Table VIII

Significant Differences Between Trials (Rest) Using Tukey Test* for (1) Systolic Blood Pressure and (2) Diastolic Blood Pressure During Isometric Exercise Bouts Using Quadriceps and Hamstring Muscle Groups

QUADRICEPS	HAMSTRINGS
Systolic Blood Pressure	Systolic Blood Pressure
160.917 - 140.33	159.874 - 145.042
160.917 - 130.667	159.875 - 134.000
155.292 - 140.333	159.875 - 123.458
155.292 - 130.667	145.042 - 134.000
	145.042 - 123.458
	134.000 - 123.458
*critical value = 9.91 @ α = .01	*critical value = 8.11 @ α = .01
Diastolic Blood Pressure	Diastolic Blood Pressure
115.250 - 99.333	115.542 - 106.917
115.250 - 89.417	115.542 - 88.833
111.042 - 99.333	115.542 - 85.667
111.042 - 89.417	106.917 - 88.833
99.333 - 89.417	106.917 - 85.667
*critical value = 8.33 @ α = .01	*critical value = 7.52 @ α = .01

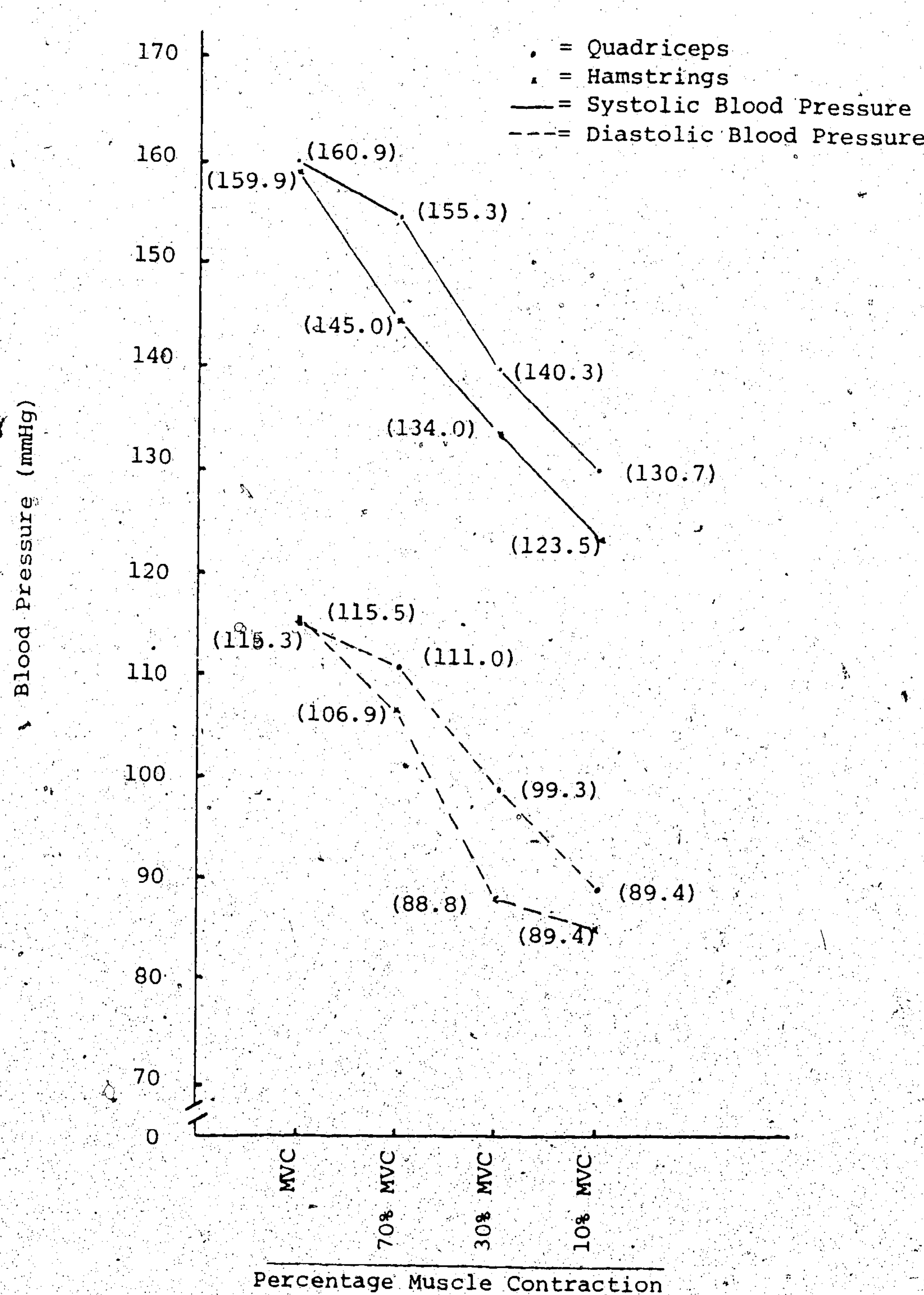

Figure 15: Systolic and Diastolic Blood Pressure During Isometric Exercise Bouts Using Quadriceps and Hamstring Muscle Groups (MVC = maximum voluntary contraction)

MVC and, between thirty percent MVC and ten percent MVC. For diastolic blood pressure, the hamstrings muscle group showed significant differences between MVC, and seventy, thirty, and ten percent MVC and, between seventy percent MVC and thirty and ten percent MVC.

The method used for the statistical analysis of the data for mean blood pressure, modified tension time index, and pulse pressure during isometric exercise bouts using quadriceps and hamstring muscle groups was a one-way analysis of variance on repeated measures. In the analysis, the term trials refers to the percentage strength of isometric contraction as the term treatment previously did in isometric exercise heart rate.

Table IX shows the values obtained in the one-way analysis of variance for mean blood pressure, modified tension time index, and pulse pressure for quadriceps and hamstring muscle group.

A Tukey Test performed on the trials for mean blood pressure, modified tension time index, and pulse pressure during isometric exercise bouts showed a significant difference occurred between those trials shown in Table X. The differences in mean blood pressure and modified tension time index for quadriceps

Table IX

Analysis of Variance for (a) Mean Blood Pressure, (b) Modified Tension Time Index, and (c) Pulse Pressure During Isometric Exercise Bouts Using (1) Quadriceps and (2) Hamstrings Muscle Groups

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
1. Quadriceps					
(a) Mean Blood Pressure					
	6692.000	23.	290.956		
TRIALS	11047.969	3.	3682.656	53.744	0.001
	4728.000	69.	68.522		
(b) Modified Tension Time Index					
	55412.000	23.	2409.217		
TRIALS	171765.000	3.	57255.000	86.226	0.001
	45817.000	69.	664.014		
(c) Pulse Pressure					
	6634.375	23.	288.451		
TRIALS	377.438	3.	125.813	1.312	0.278
	6618.000	69.	95.913		

Table IX continued

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
2. Hamstrings					
(a) Mean Blood Pressure					
	5620.000	23.	244.348		
TRIALS	15425.906	3.	5141.969	94.361	0.001
	3760.000	69.	54.493		
(b) Modified Tension Time Index					
	40019.000	23.	1739.956		
TRIALS	153214.500	3.	51071.500	81.362	0.001
	43312.000	69.	627.710		
(c) Pulse Pressure					
	1116.656	3.	372.219	6.222	0.001
TRIALS	4127.750	69.	59.822		

Table X

Significant Differences Between Trials Using Tukey Test* for Mean Blood Pressure, Modified Tension Time Index and Pulse Pressure During Isometric Exercise Bouts Using Quadriceps and Hamstring Muscle Groups

QUADRICEPS	HAMSTRINGS
(a) Mean Blood Pressure	(a) Mean Blood Pressure
130.342 - 112.887	130.190 - 119.506
130.342 - 103.063	130.190 - 103.785
125.665 - 112.887	130.190 - 98.116
125.665 - 103.063	119.505 - 103.785
112.887 - 103.063	119.505 - 98.166
*critical value = 7.76 @ α = .01	*critical value = 6.92 @ α = .01
(b) Modified Tension Time Index	(b) Modified Tension Time Index
193.694 - 119.017	184.261 - 148.103
193.694 - 90.570	184.261 - 98.897
178.900 - 119.017	184.261 - 83.619
178.900 - 90.570	148.103 - 98.897
119.017 - 90.570	148.103 - 83.619
*critical value = 24.14 @ α = .01	*critical value = 23.47 @ α = .01
(c) Pulse Pressure	(c) Pulse Pressure
no significance	45.167 - 37.792
	*critical value = 7.25 @ α = .01

and hamstring muscle groups are shown in Figures 16 and 17.

As shown in Figure 16, for the quadriceps muscle group, there were significant differences in the mean blood pressure between MVC, and thirty and ten percent MVC; between seventy percent, and thirty and ten percent MVC; and, between thirty percent MVC and ten percent MVC. For the hamstrings muscle group, there were significant differences between MVC, and seventy, thirty, and ten percent MVC, and between seventy percent MVC, and thirty and ten percent MVC.

For the quadriceps muscle group, there were significant differences in the modified tension time index between MVC, and thirty and ten percent MVC; between seventy percent MVC, and thirty and ten percent MVC; and, between thirty percent MVC and ten percent MVC. For the hamstring muscle group, there were significant differences between MVC, and seventy, thirty, and ten percent MVC, and between seventy percent MVC, and thirty and ten percent MVC. There is no significant difference in pulse pressure between the percentage contractions for the quadriceps muscle group. For the hamstring muscle group, there is a significant difference in pulse pressure between thirty percent MVC and ten percent MVC only.

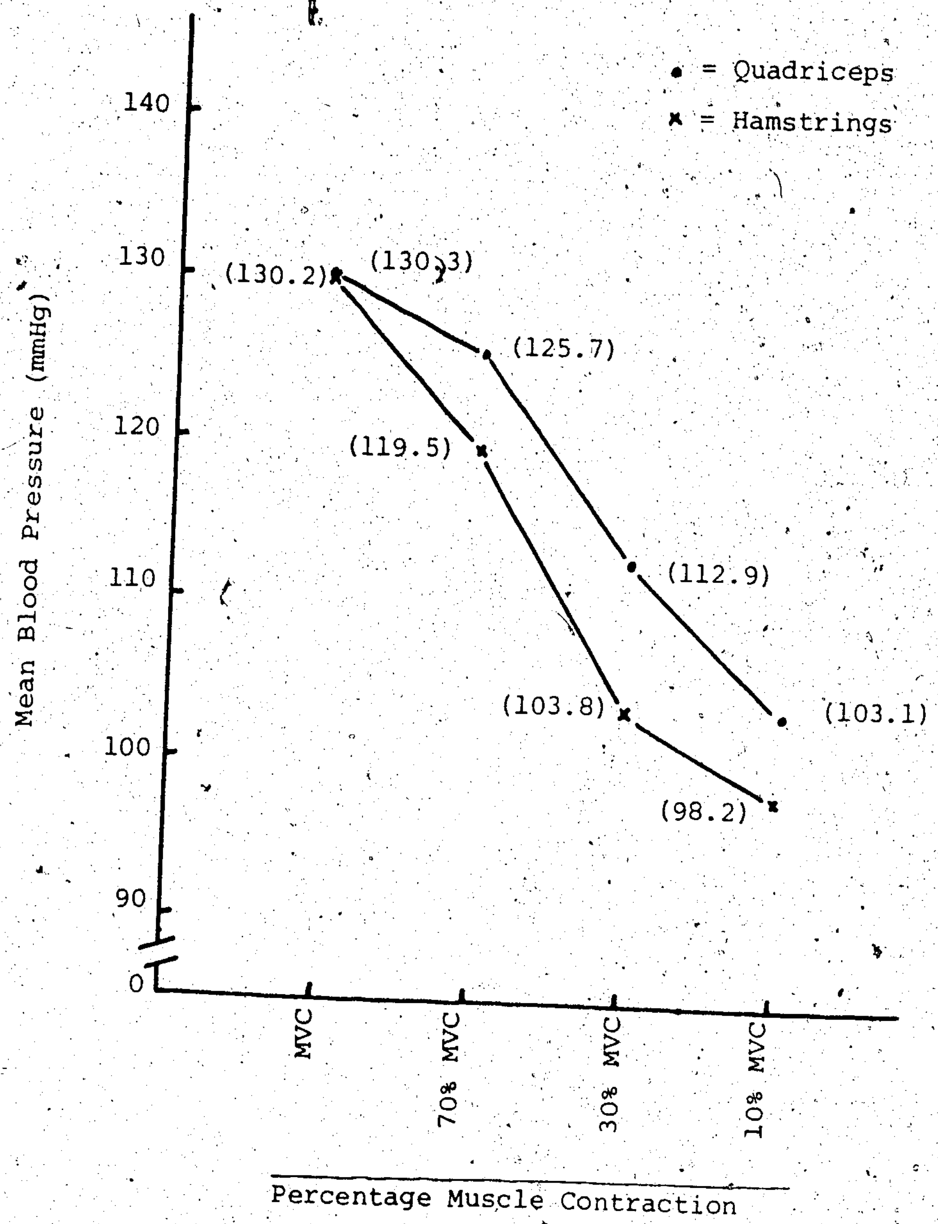

Figure 16: Mean Blood Pressure During Isometric Exercise Bouts Using Quadriceps and Hamstring Muscle Groups (MVC = maximum voluntary contraction)

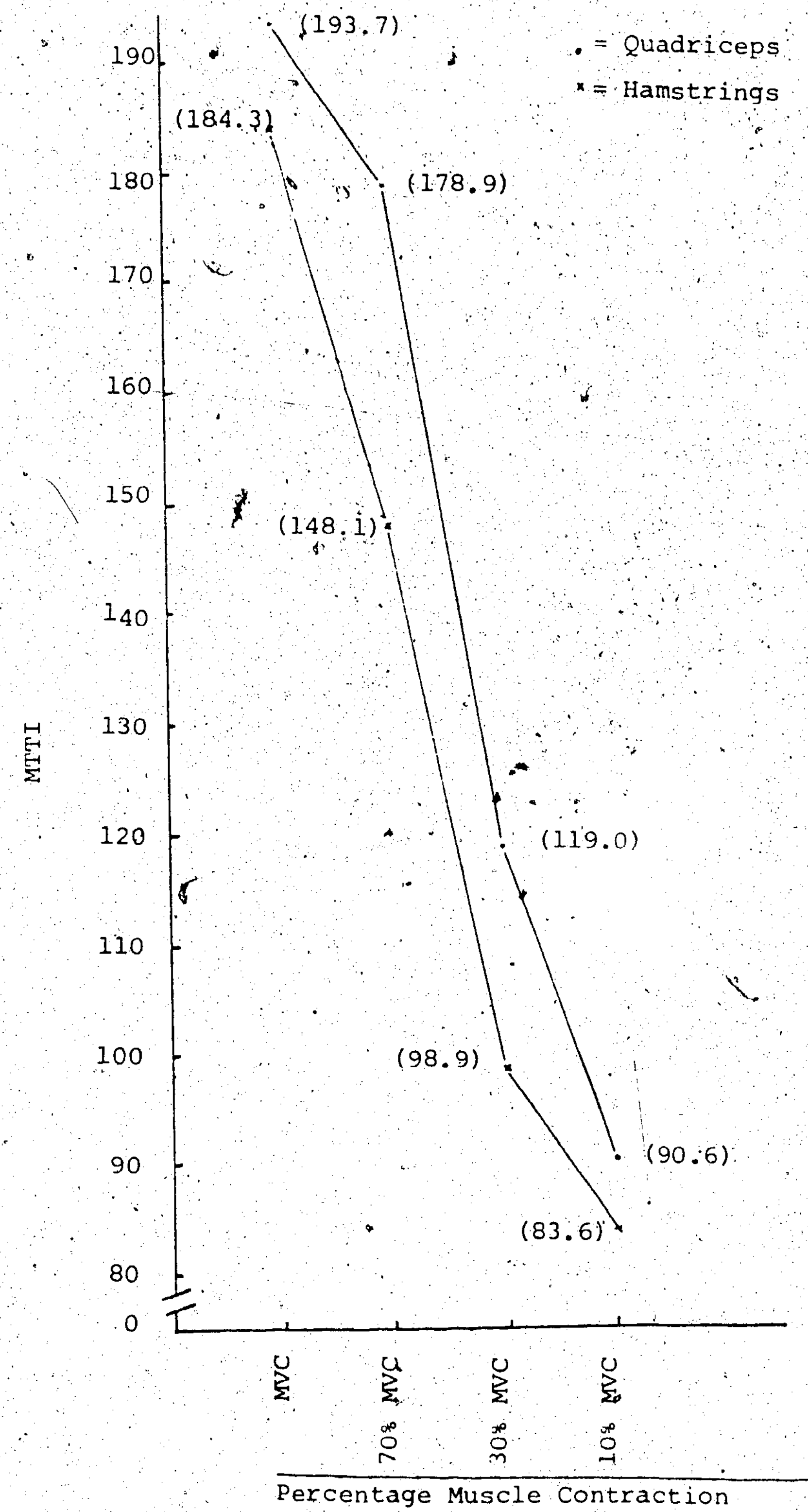

Figure 17: Modified Tension Time Index During Isometric Exercise Bouts Using Quadriceps and Hamstring Muscle Groups (MVC = maximum voluntary contraction)

Effect of Isokinetic Exercise on Heart Rate and Blood Pressure

The method used for the statistical analysis of the data for heart rate during isokinetic rest periods was a three-way analysis of variance on repeated measures. In the analysis, the terms speed, rest, and trials refer to the following: (1) speed - three speeds were chosen for the isokinetic apparatus - 30 degrees per second (low), 90 degrees per second (medium), and 150 degrees per second (high); (2) rest - the rest periods were set up as follows: one rest period of three minutes duration prior to exercise, one rest period of three minutes duration following each of the first two isokinetic exercise bouts, and three rest periods of three minutes each following the third exercise bout. This sequence was used to establish an isokinetic interval program of one minute followed by a three minute rest with the final three-three minute rest periods used to allow the heart rate and blood pressure return to near resting levels; (3) Trials refers to the order in which the selected speed of isokinetic exercise was performed during the isokinetic interval session for that particular test day.

Table XI shows the values obtained in the three-way analysis of variance for heart rate during isokinetic rest periods. Significant differences were

Table XI

Analysis of Variance for Heart Rate During Isokinetic Rest Periods

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
	176233.00	23.	7662.301		
SPEED	11625.000	2.	5812.500	7.860	0.001
	34019.000	46.	739.532		
REST	79564.500	5.	15912.898	71.134	0.001
	25726.000	115.	223.704		
SPEED/REST INTERACTION	6075.000	10.	607.500	10.067	0.001
	13880.000	230.	60.348		
TRIALS	4770.000	2.	2385.000	28.131	0.001
	3900.000	46.	84.783		
SPEED/TRIALS INTERACTION	336.000	4.	84.000	2.204	0.075
	3507.000	92.	38.120		
REST/TRIALS INTERACTION	9954.000	10.	995.400	22.329	0.001
	10253.000	230.	44.578		
REST/SPEED/TRIALS INTERACTION	582.000	20.	29.100	0.799	0.716
	16757.000	460.	36.428		

found between the different speeds, between the different rest periods, and between the different trials. Significance in the interaction was found between speed and rest, and rest and trials.

The data showed that the significant interaction between speed and rest occurred primarily between the initial rest period and the first post-exercise period. There was also an interaction between the first and second post-exercise rest periods for the medium and high speeds.

For the interaction between rest and trials, the main significant interaction occurred between the pre-exercise period or initial rest period and the first post-test exercise period, as well as between the second post-exercise rest period and the third post-exercise period.

The method used for statistical analysis of the data for both systolic and diastolic blood pressure during isokinetic rest periods was a three-way analysis of variance on repeated measures. In the analysis, the terms speed, rest, and trials refer to the same terms as used in analysis of heart rate data for isokinetic rest periods.

Table XII shows the values obtained in the three-way analysis of variance for systolic blood pressure during isokinetic rest periods. Significant differences were found between the different speeds, between the different rest periods, and between the different trials. Significance in the interaction was found between speed and rest, and rest and trials.

The data showed that the significant interaction between speed and rest occurred primarily between the initial rest period and the first post-exercise period. The main significant interaction between rest and trials occurred again between the pre-exercise rest period and the first post-test period.

Table XIII shows the values obtained in the three-way analysis of variance for diastolic blood pressure during isokinetic rest periods. Significant differences were found only between the different rest periods.

The method of statistical analysis of the data for mean blood pressure, modified tension time index, and pulse pressure during isokinetic rest periods was a one-way analysis of variance on repeated measures. In the analysis, the term trials refers to the rest periods before and after the exercise bouts. There was one rest period of three minutes duration prior to

Table XII

Analysis of Variance for Systolic Blood Pressure During Isokinetic Rest Periods

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
	99904.000	23.	4343.648		
SPEED	8914.500	2.	4457.250	10.301	0.001
	19904.000	46.	432.696		
REST	160503.000	5.	32100.598	152.092	0.001
	24272.000	115.	211.061		
SPEED/REST INTERACTION	4299.000	10.	429.900	6.609	0.001
	14960.000	230.	65.043		
TRIALS	25054.500	2.	12527.250	290.450	0.001
	1984.000	46.	43.130		
SPEED/TRIALS INTERACTION	57.000	4.	14.250	0.635	0.639
	2064.000	92.	22.435		
REST/TRIALS INTERACTION	13965.000	10.	1396.500	76.330	0.001
	4208.000	230.	18.296		
SPEED/REST/TRIALS INTERACTION	189.000	20.	9.450	0.536	0.951
	8112.000	460.	17.635		

Table XIII

Analysis of Variance for Diastolic Blood Pressure During Isokinetic Rest Periods

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
	110651.000	23.	4810.910		
SPEED	1951.500	2.	975.750	0.944	0.396
	47547.000	46.	1033.630		
REST	18972.000	5.	3794.400	4.697	0.001
	92903.000	115.	807.852		
SPEED/REST	6681.000	10.	668.100	0.947	0.491
	162342.000	230.	705.835		
TRIALS	1452.000	2.	726.000	0.948	0.391
	34866.000	46.	757.956		
SPEED/TRIALS INTERACTION	1768.500	4.	442.125	0.673	0.612
	60455.000	92.	657.119		
REST/TRIALS INTERACTION	9120.000	10.	912.000	1.390	0.186
	150884.000	230.	656.017		
SPEED/REST/TRIALS INTERACTION	15748.500	20.	787.425	1.211	0.240
	299063.000	460.	650.137		

exercise, one rest period of three minutes duration following each of the first two exercise bouts, and three rest periods of three minutes each following the third exercise bout (see Figure 18 as example).

Table XIV shows the values obtained in the one-way analysis of variance for mean blood pressure, modified tension time index, and pulse pressure. Significant differences were found in the modified tension time index and pulse pressure, but not in the mean blood pressure.

A Tukey Test performed on the trials for modified tension time index and pulse pressure showed a significant difference occurred between those trials shown in Table XV.

The results of the Tukey Test on modified tension time index indicated that there were significant differences that occurred between the pre-exercise resting levels and all the post-exercise values. There were also some significant differences between individual values in the post-exercise resting levels. For example, the first value in each of the post-exercise sessions was significantly different from the other.

For pulse pressure, the results of the Tukey Test showed that there were statistically significant differences between the pre-exercise resting levels

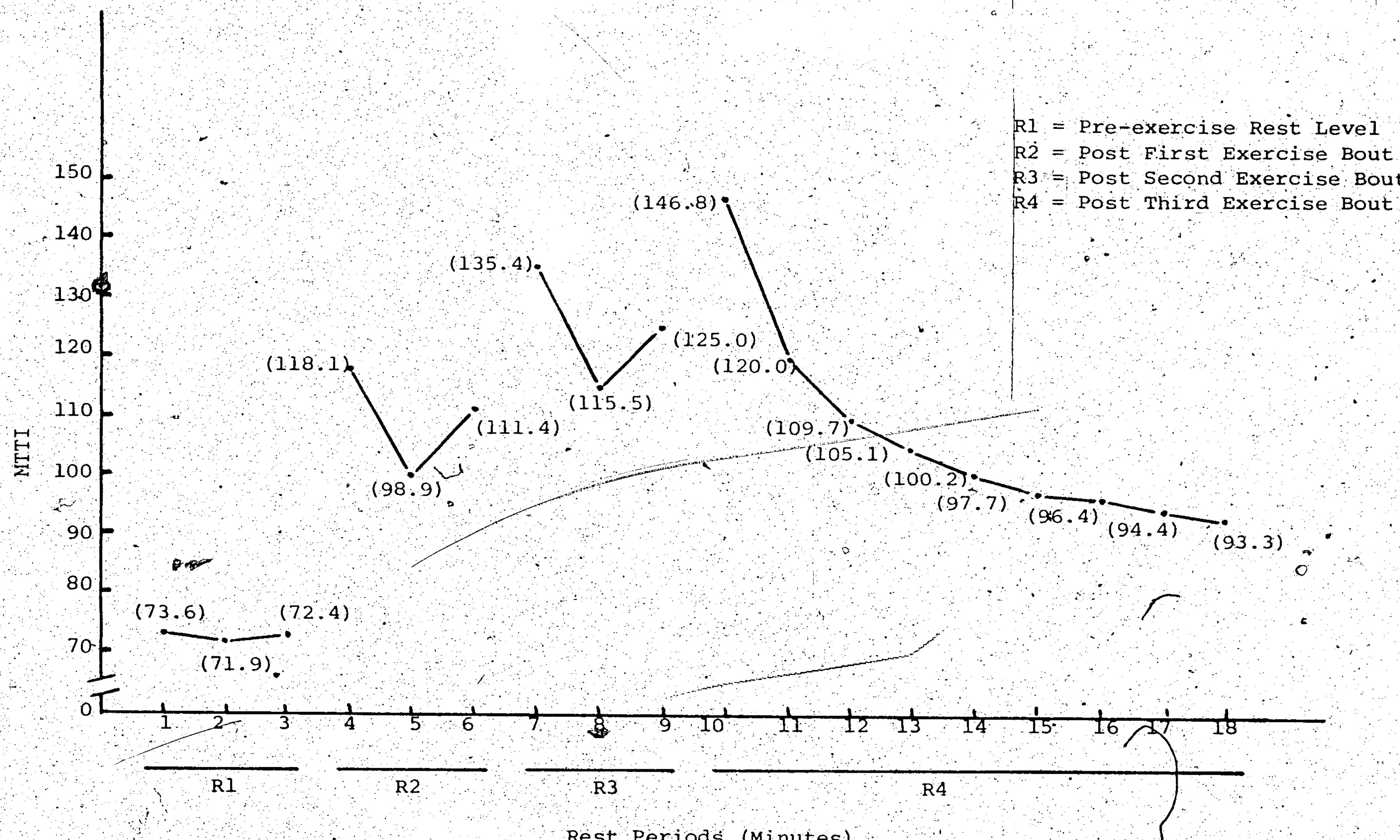

Figure 18: Modified Tension Time Index During Isokinetic Rest Periods

Table XIV

Analysis of Variance for (1) Mean Blood Pressure (2) Modified Tension Time Index, and (3) Pulse Pressure During Isokinetic Rest Periods

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
(1) Mean Blood Pressure	83258.000	71.	1172.648		
TRIALS	6412.500	17.	377.206	1.229	0.233
(2) Modified Tension Time Index	495849.000	71.	6983.785		
TRIALS	519777.000	17.	30575.117	144.981	0.001
	254545.000	1207.	210.891		
(3) Pulse Pressure	298085.000	71.	4198.379		
TRIALS	358995.375	17.	21117.375	28.511	0.001
	393995.000	1207.	740.675		

Table XV

Significant Differences Between Trials Using Tukey Test* for Modified Tension Time Index and Pulse Pressure During Isokinetic Rest Periods

MODIFIED TENSION TIME INDEX	MODIFIED TENSION TIME INDEX	PULSE PRESSURE
73.622 - 118.101	71.861 - 100.184	37.403 - 68.597
73.622 - 98.937	71.861 - 97.676	37.403 - 66.972
73.622 - 111.398	71.861 - 96.422	37.403 - 89.958
73.622 - 135.379	81.861 - 94.434	37.403 - 71.889
73.622 - 115.495	71.861 - 93.325	37.403 - 96.681
73.622 - 124.967	72.355 - 118.101	37.403 - 72.597
73.622 - 146.796	72.355 - 98.937	36.833 - 68.597
73.622 - 119.953	72.355 - 111.398	36.833 - 66.972
73.622 - 109.665	72.355 - 135.379	36.833 - 89.958
73.622 - 105.149	72.355 - 115.495	36.833 - 71.889
73.622 - 100.184	72.355 - 124.967	36.833 - 64.417
73.622 - 97.676	72.355 - 145.796	36.833 - 96.681
73.622 - 96.422	72.355 - 119.953	36.833 - 72.639
73.622 - 94.434	72.355 - 109.665	37.028 - 68.597
73.622 - 93.325	72.355 - 105.149	37.028 - 66.972
71.861 - 118.101	72.355 - 100.184	37.028 - 89.958
71.861 - 98.937	72.355 - 97.676	37.028 - 71.889
71.861 - 111.398	72.355 - 96.422	37.028 - 96.681
71.861 - 135.379	72.355 - 94.434	37.028 - 72.639
71.861 - 115.495	72.355 - 93.325	68.597 - 96.681
71.861 - 124.967	118.101 - 98.937	66.972 - 96.681
71.861 - 146.796	118.101 - 135.379	60.375 - 89.958
71.861 - 119.953	118.101 - 146.796	60.375 - 96.681
71.861 - 109.665	118.101 - 100.184	89.958 - 62.208
71.861 - 105.149	118.101 - 97.676	89.958 - 57.278
	118.101 - 96.422	
	118.101 - 94.434	
	118.101 - 93.325	
	98.937 - 135.379	

Table XV continued

MODIFIED TENSION TIME INDEX	MODIFIED TENSION TIME INDEX	PULSE PRESSURE
98.937 - 115.495	124.967 - 96.422	89.958 - 53.528
98.937 - 124.967	124.967 - 94.434	89.958 - 50.583
98.937 - 145.796	124.967 - 93.325	89.958 - 48.056
96.937 - 119.953	146.796 - 119.953	89.958 - 45.722
111.393 - 135.379	146.796 - 109.665	89.958 - 44.222
111.398 - 145.796	146.796 - 105.149	64.417 - 96.681
111.398 - 94.434	146.796 - 100.184	96.681 - 62.208
111.398 - 93.325	146.796 - 97.671	96.681 - 57.278
135.379 - 115.495	146.796 - 96.422	96.681 - 53.528
135.379 - 119.053	146.796 - 94.434	96.681 - 50.583
135.379 - 109.665	146.796 - 93.325	96.681 - 48.056
135.379 - 105.149	119.953 - 105.149	96.681 - 45.722
135.379 - 100.184	119.953 - 100.184	96.681 - 44.222
135.379 - 98.676	119.953 - 97.676	[illegible]2.639 - 44.222
135,379 - 96.422	119.953 - 96.422	
135.379 - 94.434	119.953 - 94.434	
135.379 - 93.325	119.953 - 93.325	
115.495 - 145.796	109.665 - 93.325	
115.495 - 100.184		
115.495 - 97.676		
115.495 - 96.422		
115.495 - 94.434		
115.495 - 93.325		
124.967 - 146.796		
124.967 - 109.665		
124.967 - 105.149		
124.967 - 100.184		
124.967 - 97.676		
	critical value = 14.61 @ α = .01	critical value = 27.39 @ α = .01

and all immediate post-exercise values. There were also significant differences between individual values in the post-exercise resting levels but there was no obvious pattern in these differences.

The method used for the statistical analysis of the data for heart rate during the isokinetic exercise bouts was a two-way analysis of variance on repeated measures. In the analysis, the terms speed and trials refer to the following: (1) speed - three speeds were chosen for the isokinetic apparatus - 30 degrees per second (slow), 90 degrees per second (medium), and 150 degrees per second (high), and: (2) trials refers to the order in which the selected speed of isokinetic exercise was performed during the isokinetic interval session for that particular test day.

Table XVI shows the values obtained in the two-way analysis of variance for heart rate during isokinetic exercise bouts. Significant differences were found between the different speeds, between the different trials, and significant interaction was found between speed and trials.

The data showed that the primary interaction occurred between the pre-exercise value and the first post-exercise value.

Table XVI

Analysis of Variance for Heart Rate During Isokinetic Exercise Periods

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
	64577.000	23.	2807.696		
SPEED	4491.000	2.	2245.500	13.701	0.001
	7539.000	46.	163.891		
TRIALS	387814.500	3.	129271.500	385.002	0.001
	23168.000	69.	335.768		
SPEED/TRIALS INTERACTION	2391.000	6.	398.500	13.589	0.001
	4047.000	138.	29.326		

A Tukey Test performed on the heart rate of the three exercise bouts showed a significant difference between the first and third exercise trials (critical difference = 12.72).

The method used for the statistical analysis of the data for both systolic and diastolic blood pressure during isokinetic exercise bouts was a two-way analysis of variance on repeated measures. In the analysis, the terms speed and trials refer to the same terms as used in analysis of heart rate data for isokinetic exercise bouts.

Table XVII shows the values obtained in the two-way analysis of variance for systolic blood pressure during isokinetic exercise bouts. Significant differences were found only between the different trials and not between the different speeds.

Table XVIII shows the values obtained in the two-way analysis of variance for diastolic blood pressure during isokinetic exercise. Significant differences were found only between different trials and not between different speeds.

A Tukey Test performed on the trials for systolic and diastolic blood pressure during isokinetic exercise bouts showed that the significant difference

Table XVII

Analysis of Variance for Systolic Blood Pressure During Isokinetic Exercise Bouts

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
	41292.000	23.	1795.304		
SPEED	22.500	2.	11.250	0.044	0.957
	11743.000	46.	255.283		
TRIALS	181329.000	3.	60443.000	402.331	0.001
	10366.000	69.	150.232		
SPEED/TRIALS INTERACTION	460.500	6.	76.750	1.100	0.366
	9629.000	138.	69.775		

Table XVIII

Analysis of Variance for Diastolic Blood Pressure During Isokinetic Exercise Periods

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
	61934.938	23.	2692.823		
SPEED	822.375	2.	411.188	2.188	0.124
	8644.313	46.	187.920		
TRIALS	83300.625	3.	27766.875	109.479	0.001
	17500.250	69.	253.726		
SPEED/TRIALS INTERACTION	549.094	6.	91.506	2.056	0.062
	6151.500	138.	44.504		

occurred between trial one, which was the mean of the initial rest period, and thre three exercise bouts. No significant differences occurred between the three exercise bouts. This difference is illustrated in Figure 19.

The method used for the statistical analysis of the data for mean blood pressure, modified tension time index, and pulse pressure during isokinetic exercise bouts was a one-way analysis of variance on repeated measures. In the analysis, the term trial refers to the order of the different speeds of isokinetic exercise. Trials one to four occurred at thirty degrees per second; trials five to eight occurred at ninety degrees per second, and; trials nine to twelve occurred at 150 degrees per second (see Figure 20 as example). Trials one, five and nine were pre-test rest intervals to enable comparison between resting and exercise levels.

Table XIX shows the values obtained in the one-way analysis of variance for mean blood pressure, modified tension time index, and pulse pressure during isokinetic exercise. Significant differences were found in each test.

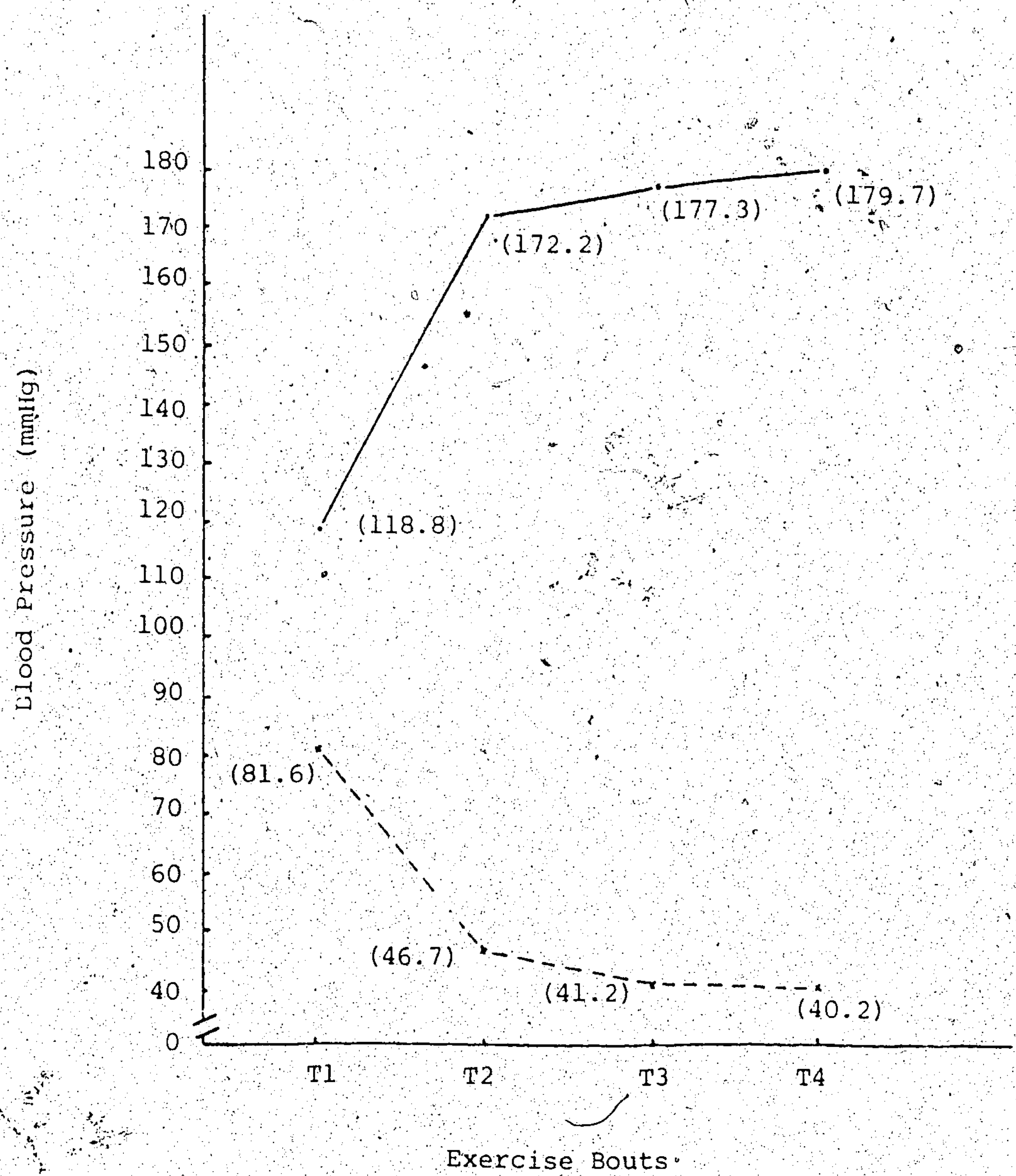

Figure 19: Systolic and Diastolic Blood Pressures During Isokinetic Exercise Bouts. (Note: T1 is Pre-exercise Rest Period)

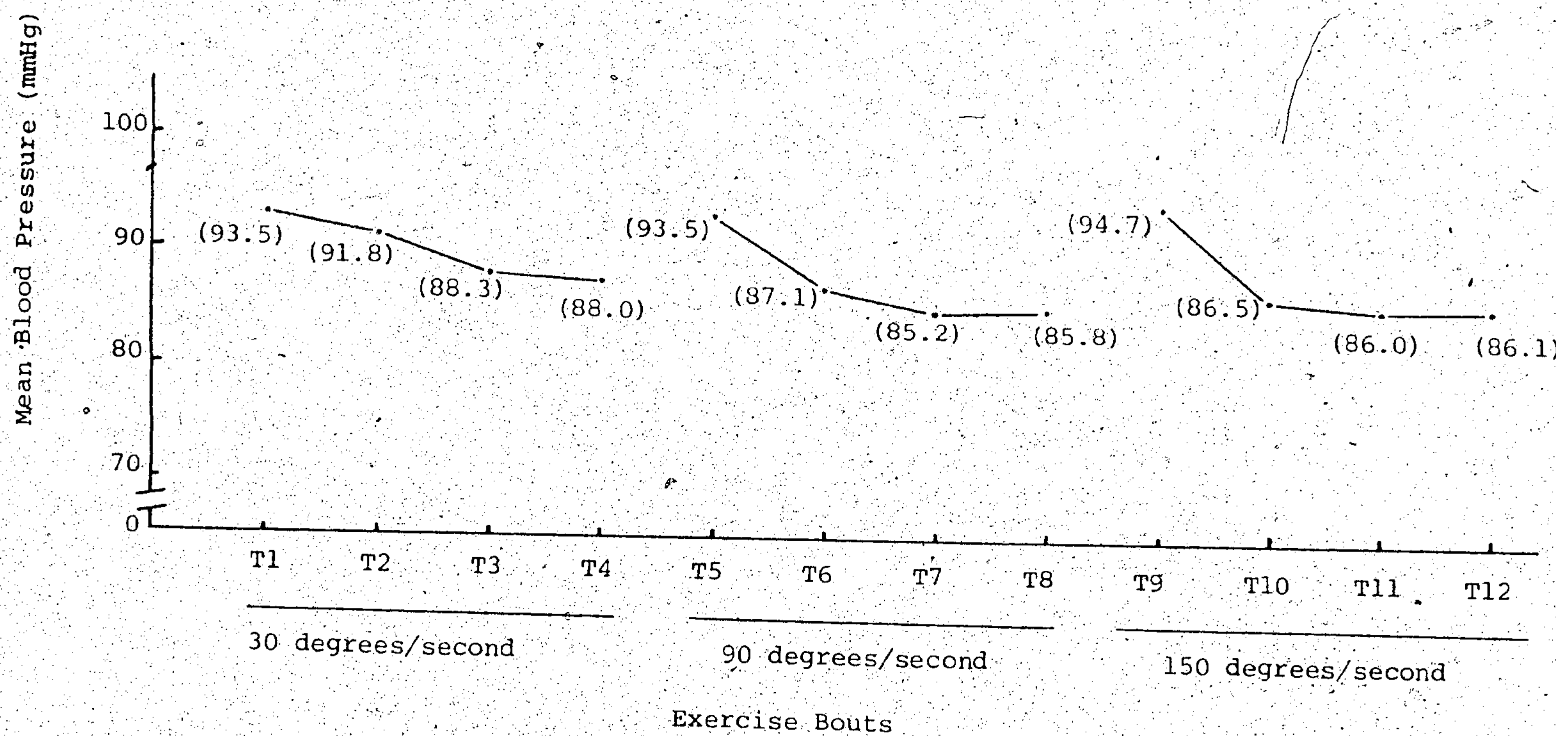

Figure 20: Mean Blood Pressure During Isokinetic Exercise Bouts

Table XIX

Analysis of Variance for (1) Mean Blood Pressure (2) Modified Tension Time Index, and (3) Pulse Pressure During Isokinetic Exercise Periods

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARES	F RATIO	PROBABILITY
(a) Mean Blood Pressure	33324.000	23.	1448.869		
TRIALS	3204.000	11.	291.273	3.965	0.001
	18585.000	253.	73.458		
(b) Modified Tension Time Index	202786.000	23.	8816.781		
TRIALS	1887951.000	11.	171631.875	277.574	0.001
	156437.000	253.	618.328		
(c) Pulse Pressure	97469.000	23.	4237.781		
TRIALS	512283.000	11.	46571.180	194.248	0.001
	60654.000	253.	239.739		

A Tukey Test performed on the trials for mean blood pressure during isokinetic exercise bouts showed that a significant difference occurred only between trial seven and trial nine (see Figure 20).

A Tukey Test performed on the trials for the modified tension time index during isokinetic exercise bouts showed a significant difference occurred between those trials shown in Table XX. This difference is also shown in Figure 21.

The data showed that the statistically significant difference in modified tension time index occurred between the pre-exercise rest level and the three exercise levels for all three speeds of isokinetic exercise tested. There were significant differences between the first isokinetic exercise bout and the last exercise bout for all three speeds. As well, this difference was also evident between the first and the second exercise bouts for the 150 degree per second speed.

A Tukey Test performed on the trials for the pulse pressure during isokinetic exercise bouts showed a significant difference occurred between those trials shown in Table XXI. This difference is also shown in Figure 22.

Table XX

Significant Differences Between Trials Using Tukey Test* for Modified Tension Time Index During Isokinetic Exercise

TRIAL - TRIAL	TRIAL - TRIAL
74.468 - 224.091	243.578 - 282.822
74.468 - 243.578	257.984 - 73.879
74.468 - 257.984	257.984 - 70.521
74.468 - 242.117	73.879 - 242.117
74.468 - 263.856	73.879 - 263.856
84.468 - 276.780	73.879 - 276.780
74.468 - 244.430	73.879 - 244.430
74.468 - 271.701	73.879 - 271.701
74.468 - 282.822	73.879 - 282.822
224.091 - 257.984	242.117 - 276.780
224.091 - 73.879	242.117 - 70.521
224.091 - 263.856	242.117 - 271.701
224.091 - 276.780	242.117 - 282.822
224.091 - 70.521	263.856 - 70.521
224.091 - 271.701	276.780 - 70.521
224.091 - 282.822	276.780 - 244.430
243.578 - 73.879	70.521 - 244.430
243.578 - 276.780	70.521 - 271.701
243.578 - 70.521	70.521 - 282.822
243.578 - 271.701	244.430 - 271.701
	244.430 - 282.822

*critical value = 26.85 @ α = .01

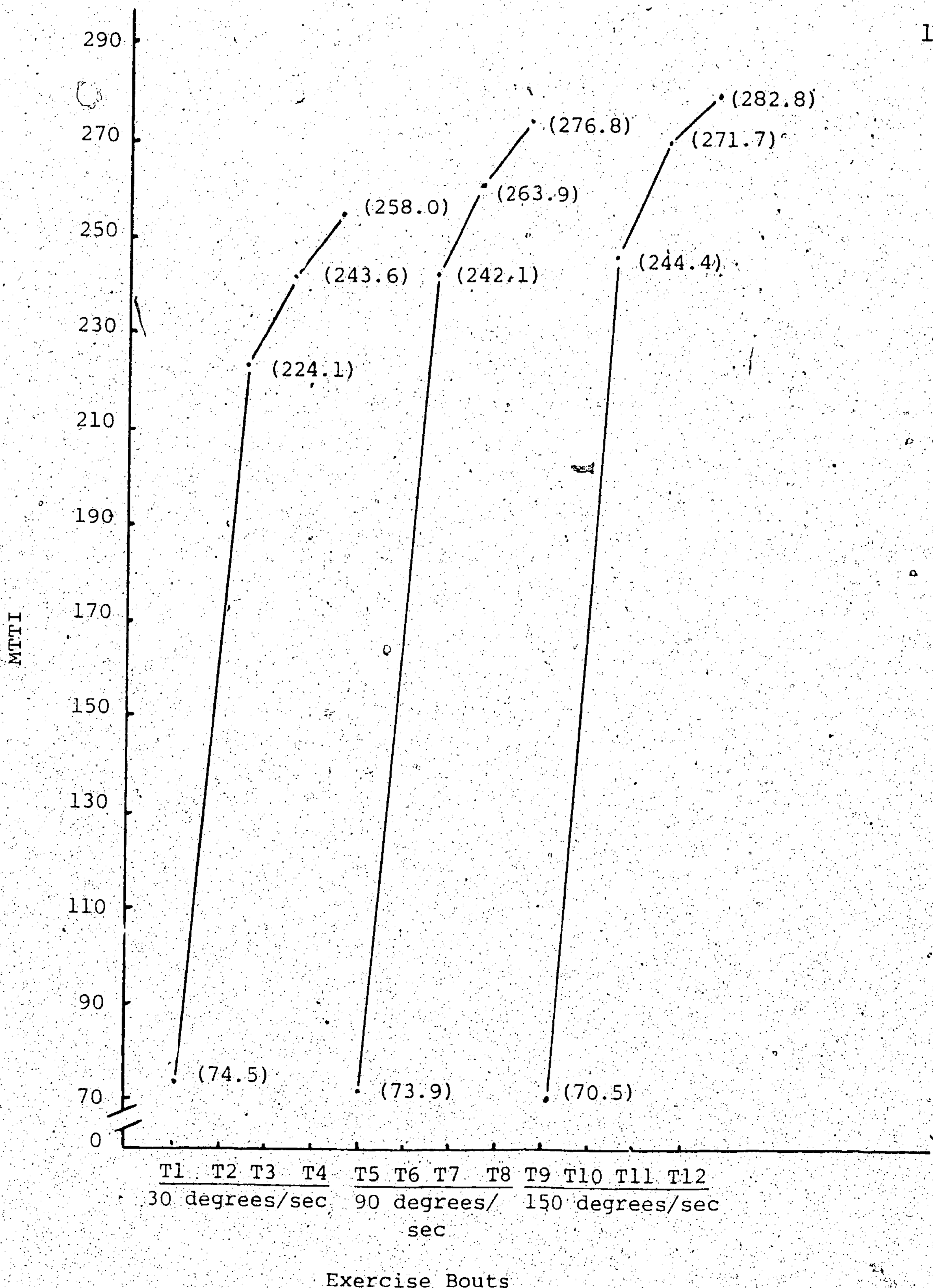

Figure 21: Modified Tension Time Index During Isokinetic Exercise Bouts

Table XXI

Significant Differences Between Trials Using Tukey Test* for Pulse Pressure During Isokinetic Exercise

TRIAL - TRIAL	TRIAL - TRIAL
38.292 - 123.417	134.250 - 37.708
38.292 - 131.167	134.250 - 35.542
38.292 - 134.250	37.708 - 125.542
38.292 - 125.542	37.708 - 137.500
38.292 - 137.500	37.708 - 142.208
38.292 - 142.208	37.708 - 126.875
38.292 - 126.875	37.708 - 139.583
38.292 - 139.583	37.708 - 141.792
38.292 - 141.792	125.542 - 35.542
123.917 - 37.708	137.500 - 35.542
123.917 - 142.408	142.208 - 35.542
123.917 - 35.542	35.542 - 126.875
123.917 - 141.792	35.542 - 139.583
131.167 - 37.708	35.542 - 141.792
131.167 - 35.542	

*critical value = 16.72 @ α = .01

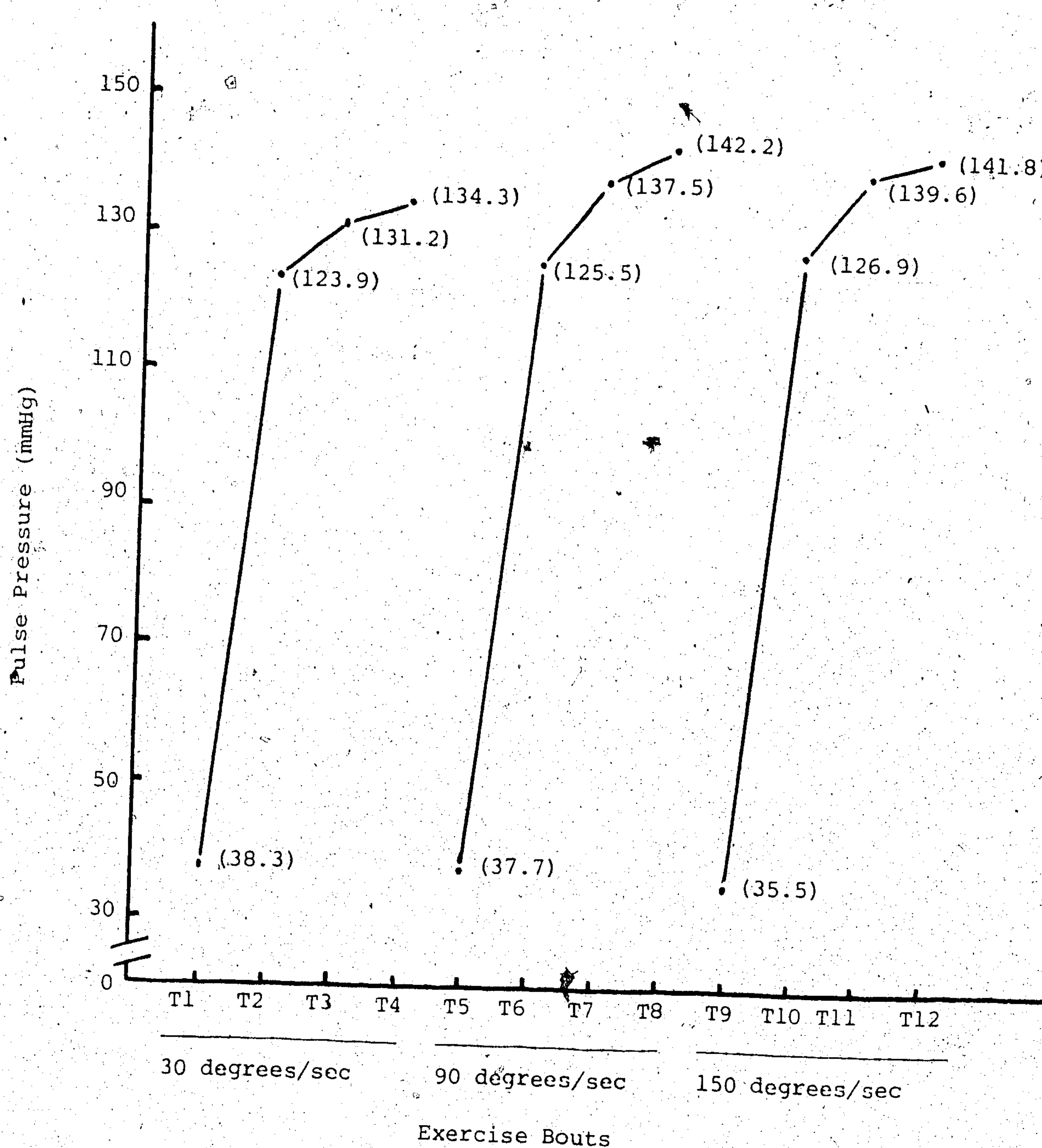

Figure 22: Pulse Pressure During Isokinetic Exercise Bouts

The data showed that there was a statistically significant difference in pulse pressure between the pre-exercise rest level and the three exercise levels for all three speeds of isokinetic exercise tested. There was no significant differences between the three exercise levels for all three speeds of isokinetic exercise tested.

<u>Comparison of Effect of Isometric and Isokinetic Exercise on Heart Rate and Blood Pressure</u>

In comparing the effect of isometric and isokinetic exercise on heart rate and blood pressure, only the effect of maximum voluntary contraction on heart rate and blood pressure for isometric exercise and the first isokinetic exercise bout were considered. As well, the mean blood pressure modified tension time index, and pulse pressure for maximum isometric exercise and isokinetic exercise were analyzed.

The method used for the statistical analysis of the data for heart rate during maximum isometric exercise and isokinetic exercise was a one-way analysis of variance. In the analysis, the term comheart refers to the heart rate during isokinetic exercise at thirty, ninety and 150 degrees per second, and during maximum voluntary contraction of isometric exercise. Heart 1, 2, and 3 refer to the heart rate during isokinetic exercise at thirty degrees per second, ninety degrees per second, and 150 degrees per second, respectively. Heart 3 and 4 refer to the heart rate during maximum voluntary isometric contraction using quadriceps and hamstring muscle groups respectively.

Table XXII shows the values obtained in the one-way analysis of variance for comparison of heart rate during isometric and isokinetic exercise. The difference of the means is illustrated in Figure 23. A Scheffe Test performed on the means of the heart rate during isometric and isokinetic exercise showed that a significant difference occurred between those means shown in Table XXIII.

The data indicated there was a significant difference in heart rates between the isokinetic exercise and the isometric exercise. As well, the slow speed (thirty degrees per second) values was significantly different than the other two speeds of isokinetic exercise. Isometric quadriceps muscle group data for heart rate was also statistically different from the isometric hamstring muscle group data.

The method used for the statistical analysis of the data for systolic blood pressure during maximum isometric exercise and isokinetic exercise was a one-

Table XXII

Analysis of Variance for Comparison of Heart Rates During Isokinetic and Maximum (Isometric) Exercise

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROBABILITY
BETWEEN GROUPS	4	15073.7028	3768.4255	8.867	0.0000
WITHIN GROUPS	115	48872.9453	424.9819		
TOTAL	119	63946.6445			

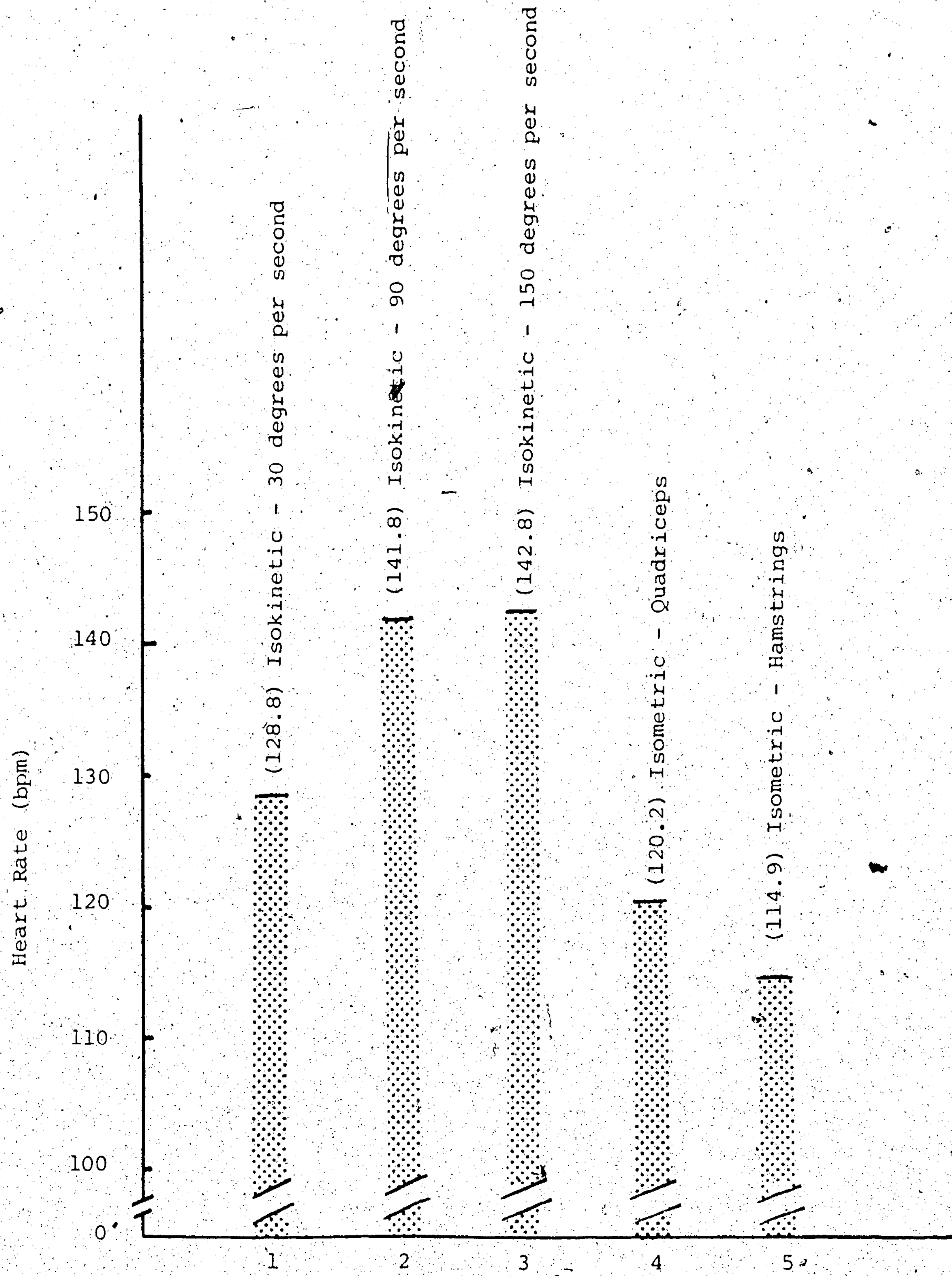

Figure 23: Maximum Heart Rate During Isokinetic and Isometric Exercise

Table XXIII

Significant Differences Between Heart Rates Using Scheffe Test* During Isokinetic and Isometric Exercise

128.792 - 141.833
128.792 - 142.792
128.792 - 120.208
128.792 - 114.917
141.833 - 120.208
141.833 - 114.917
142.792 - 120.208
142.792 - 114.417
120.208 - 114.917

*critical value = 4.43 @ $\alpha = .05$

way analysis of variance. In the analysis, the term comsystolic refers to the systolic blood pressure during isokinetic and isometric exercise. Systol 1, 2, and 3 refer to the systolic blood pressure during isokinetic exercise at thirty degrees per second, ninety degrees per second, and 150 degrees per second respectively. Systol 4 and 5 refer to the systolic blood pressure during maximum voluntary isometric contraction using quadriceps and hamstring muscle groups respectively.

Table XXIV shows the values obtained in the one-way analysis of variance for comparison of systolic blood pressure during isometric and isokinetic exercise. The difference of the means is illustrated in Figure 24.

A Scheffe Test performed on the means of the systolic blood pressure during isometric and isokinetic exercise showed that a significant difference occurred between those means shown in Table XXV.

The data for systolic blood pressure showed a statistically significant difference between isokinetic exercise and isometric exercise. There were no significant differences between the different speeds of isokinetic exercise, or between the two muscle groups performing isometric exercise.

Table XXIV

Analysis of Variance for Comparison of (1) Systolic Blood Pressure and (2) Diastolic Blood Pressure During Isokinetic and Maximum Isometric Exercise

	SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROBABILITY
(1) Systolic Blood Pressure						
	BETWEEN GROUPS	4	4200.2823	1050.0706	3.395	0.115
	WITHIN GROUPS	115	35573.5039	309.3347		
	TOTAL	119	39773.7852			
(2) Diastolic Blood Pressure						
	BETWEEN GROUPS	4	136304.1758	34076.0430	120.968	0.0000
	WITHIN GROUPS	115	32394.9429	281.6951		
	TOTAL	119	168699.0625			

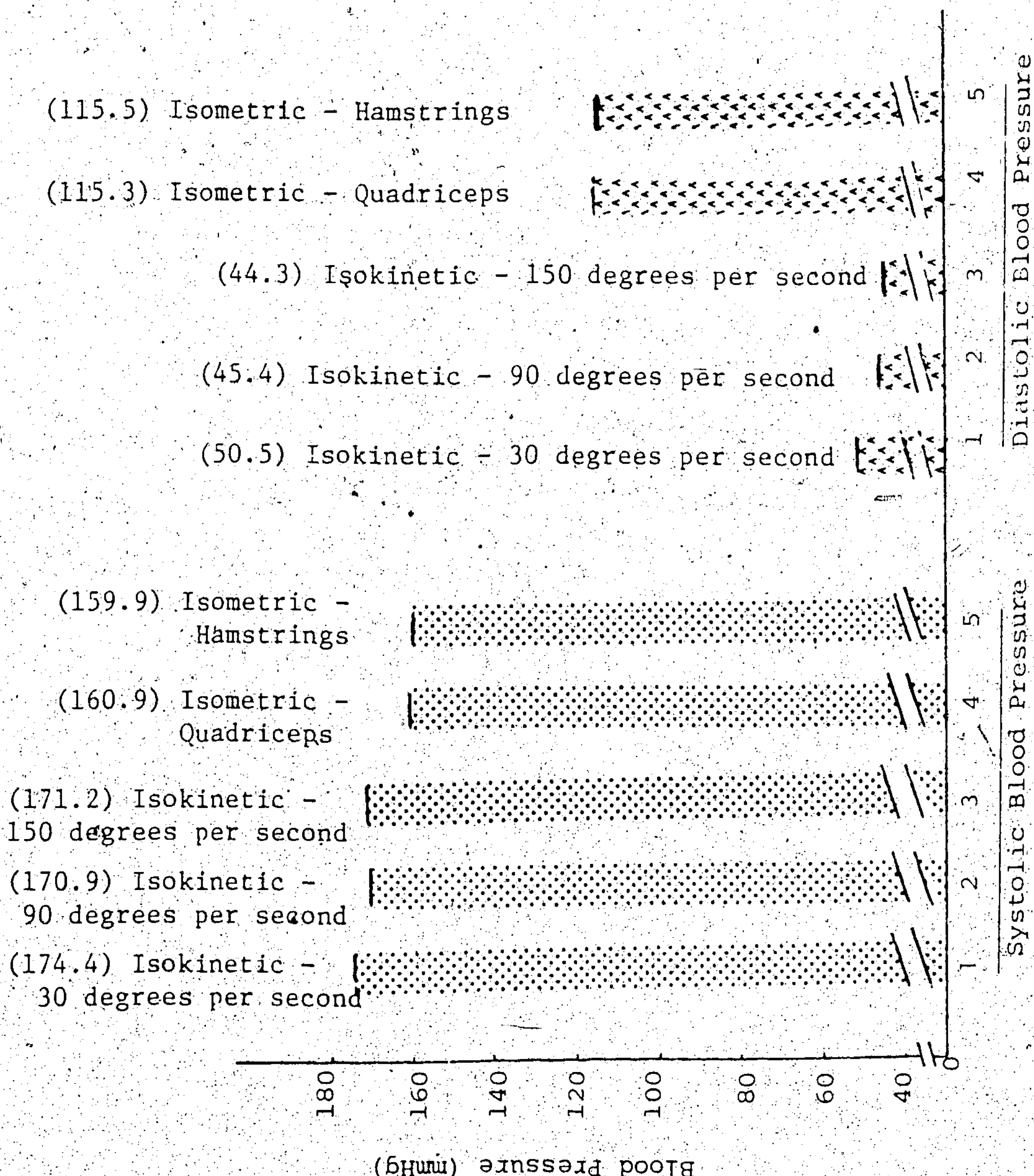

Figure 24: Maximum Systolic and Diastolic Blood Pressure During Isokinetic and Maximum Isometric Exercise

Table XXV

Significant Differences Between Means Using Scheffe Test*
for (1) Systolic Blood Pressure and (2) Diastolic Blood Pressure
During Isokinetic and Isometric Exercise

(1) SYSTOLIC BLOOD PRESSURE	(2) DIASTOLIC BLOOD PRESSURE
174.5 - 160.9	50.5 - 45.4
174.5 - 159.9	50.5 - 44.3
171.2 - 160.9	50.5 -115.3
171.2 - 159.9	50.5 -115.5
170.9 - 160.9	45.4 -115.3
170.9 - 159.9	45.4 -115.5
	44.3 -115.3
	44.3 -115.5
*critical value = 4.43 @ α = .05	*critical value = 4.43 @ α = .05

The method used for the statistical analysis of the data for diastolic blood pressure during maximum isometric exercise and isokinetic exercise was a one-way analysis of variance. In the analysis, the term comdiastolic refers to the diastolic blood pressure during isokinetic and isometric exercise. Diastol 1, 2, and 3 refer to the diastolic blood pressure during isokinetic exercise at thirty degrees per second, ninety degrees per second and 150 degrees per second, respectively. Diastol 4 and 5 refer to the diastolic blood pressure during maximum voluntary isometric contraction using quadriceps and hamstring muscle groups respectively.

Table XXIV shows the values obtained in the one-way analysis of variance for comparison of diastolic blood [illegible] during isometric and isokinetic exercise. The d[illegible]s of the means is illustrated in Figure [illegible]

A S[illegible]fe Test performed on the means of the diastoli[illegible]lood pressure during isometric and isokinetic exercise [illegible]owed that a significant difference occurred between [illegible]ose means shown in Table XXV.

For diastolic blood pressure, there was a statistically significant difference between the values for isometric exercise and isokinetic exercise. There was no statistically significant difference between the two muscle groups performing isometric exercise. However, the difference was statistically significant between the slow isokinetic speed (thirty degrees per second) and the two faster isokinetic speeds.

The method used for the statistical analysis of the data for mean blood pressure during maximum isometric exercise and isokinetic exercise was a one-way analysis of variance. In the analysis, the term COMMBP refers to the mean blood pressure during isokinetic and isometric exercise. MBP1, 2, and 3 refer to the mean blood pressure during isokinetic exercise at thirty degrees per second, ninety degrees per second, and 150 degrees per second respectively. MBP4 and 5 refer to the mean blood pressure during maximum voluntary isometric contraction using quadriceps and hamstring muscle groups respectively.

Table XXVI shows the values obtained in the one-way analysis of variance for comparison of mean blood pressure during isokinetic and isometric exercise. The difference of the means is illustrated in Figure 25.

A Scheffe Test performed on the means of the mean blood pressure during isokinetic and isometric exercise showed that a significant difference occurred between those means shown in Table XXVII.

Table XXVI

Analysis of Variance for Comparison of Mean Blood Pressure During Isokinetic and Maximum Isometric Exercise

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROBABILITY
BETWEEN GROUPS	4	50723.4418	12680.8594	70.702	0.0000
WITHIN GROUPS	115	20626.0930	179.3573		
TOTAL	119	71349.5000			

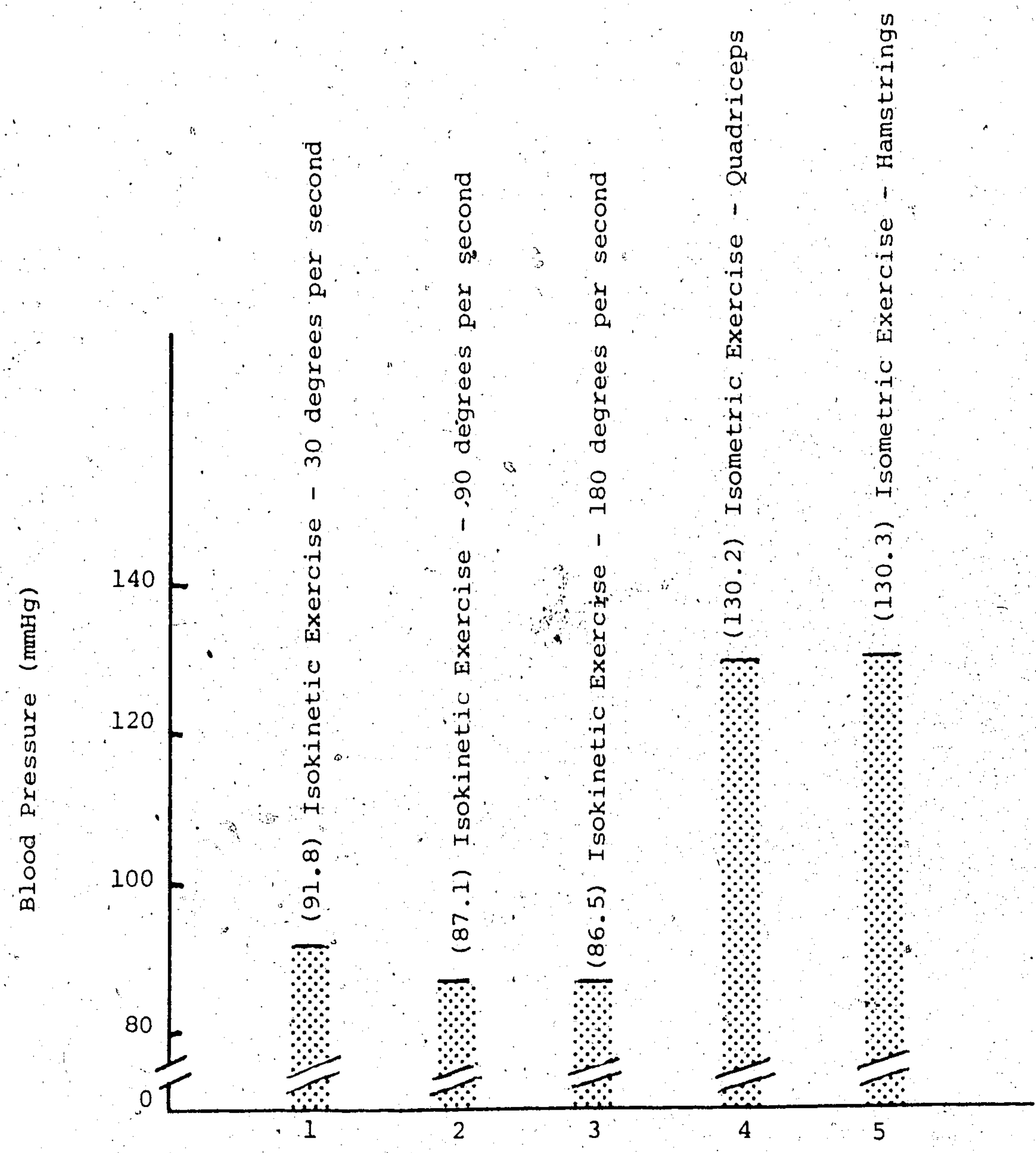

Figure 25: Mean Blood Pressure During Isokinetic and Maximum Isometric Exercise

Table XXVII

Significant Differences Between Means Using Scheffe Test*
for Mean Blood Pressure During Isokinetic and Maximum Isometric Exercise

TRIAL - TRIAL	TRIAL - TRIAL
91.8 - 87.1	87.1 - 130.2
91.8 - 86.5	87.1 - 130.3
91.8 -130.2	86.5 - 130.2
91.8 -130.3	86.5 - 130.3

*critical value = 4.43 @ α = .05

The data for mean blood pressure showed that statistically significant differences occurred between the mean blood pressure values for isokinetic exercise and isometric exercise. As well, there was a statistically significant difference in mean blood pressure between the slow (thirty degrees per second) isokinetic speed and the two faster isokinetic speeds. There was no significant difference between the two muscle groups tested isometrically.

The method used for the statistical analysis of the data for modified tension time index during maximum isometric exercise and isokinetic exercise was a one-way analysis of variance. In the analysis, the term COMMTTI refers to the modified tension time index during isokinetic and isometric exercise. MTTI1, 2 and 3 refer to the modified tension time index during isokinetic exercise at thirty degrees per second, ninety degrees per second, and 150 degrees per second respectively. MTTI4 and 5 refer to the modified tension time index during maximum voluntary isometric contraction using quadriceps and hamstring muscle groups respectively.

Table XXVIII shows the values obtained in the one-

Table XXVIII

Analysis of Variance for Comparison of Modified Tension Time Index During Isokinetic and Maximum Isometric Exercise

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROBABILITY
BETWEEN GROUPS	4	73074.5809	18268.6445	11.357	0.0000
WITHIN GROUPS	115	183994.4023	1608.6470		
TOTAL	119	258068.9375			

way analysis of variance for comparison of modified tension time index during isometric and isokinetic exercise. The difference of the means is illustrated in Figure 26.

A Scheffe Test performed on the modified tension time index during isometric and isokinetic exercise showed that a significant difference occurred between those means shown in Table XXIX.

The data for modified tension time index showed that statistically significant differences in the index occurred between isokinetic exercise and isometric exercise. As well, significant differences in the index occurred between the slow (thirty degrees per second) isokinetic speed and the two faster isokinetic speeds. There were significant differences in the index between the values obtained for the quadriceps muscle group and the hamstring muscle group during isometric exercise.

The method used for the statistical analysis of the data for pulse pressure during maximum isometric exercise and isokinetic exercise was a one-way analysis of variance. In the analysis, the term COMPP refers to the pulse pressure during isokinetic and isometric exercise. PP1, 2, and 3 refer to the pulse pressure

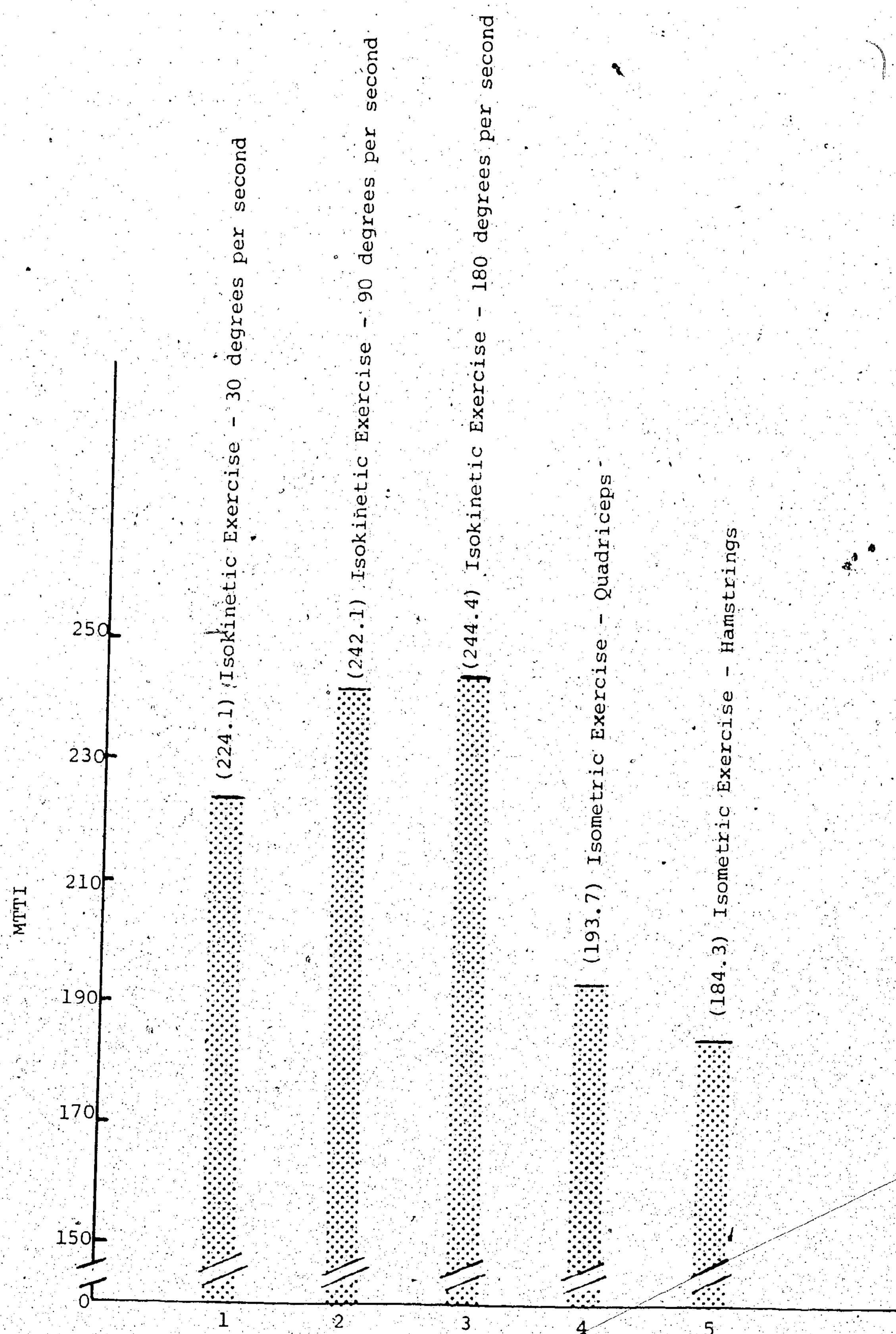

Figure 26: Modified Tension Time Index During Isokinetic and Maximum Isometric Exercise.

Table XXIX

Significant Differences Between Means Using Scheffe Test* for Modified Tension Time Index During Isokinetic and Maximum Isometric Exercise

TRIAL - TRIAL	TRIAL - TRIAL
224.1 - 242.1	242.1 - 184.3
224.1 - 244.4	244.4 - 193.7
224.1 - 193.7	244.4 - 184.3
224.1 - 184.3	193.7 - 184.3
242.1 - 193.7	

*critical value = 4.43 @ α = .05

during isokinetic exercise at thirty degrees per second respectively. PP4 and 5 refer to the pulse pressure during maximum voluntary isometric contraction using quadriceps and hamstrings respectively.

Table XXX shows the values obtained in the one-way analysis of variance for comparison of pulse pressure during isometric and isokinetic exercise. The difference between the means is illustrated in Figure 27.

A Scheffe Test performed on the means of the pulse pressure during isometric and isokinetic exercise showed that a significant difference occurred between those means shown in Table XXXI. The data showed that statistically significant differences in pulse pressure occurred between isokinetic exercise and isometric exercise. There were no significant differences in pulse pressure between the three speeds of isokinetic exercise tested, nor between the two muscle groups tested isometrically.

Table XXX

Analysis of Variance for Comparison of Pulse Pressure During Isokinetic and Maximum Isometric Exercise

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROBABILITY
BETWEEN GROUPS	4	186500.3514	46625.0859	93.177	0.0000
WITHIN GROUPS	115	57544.9792	500.3911		
TOTAL	119	244045.3125			

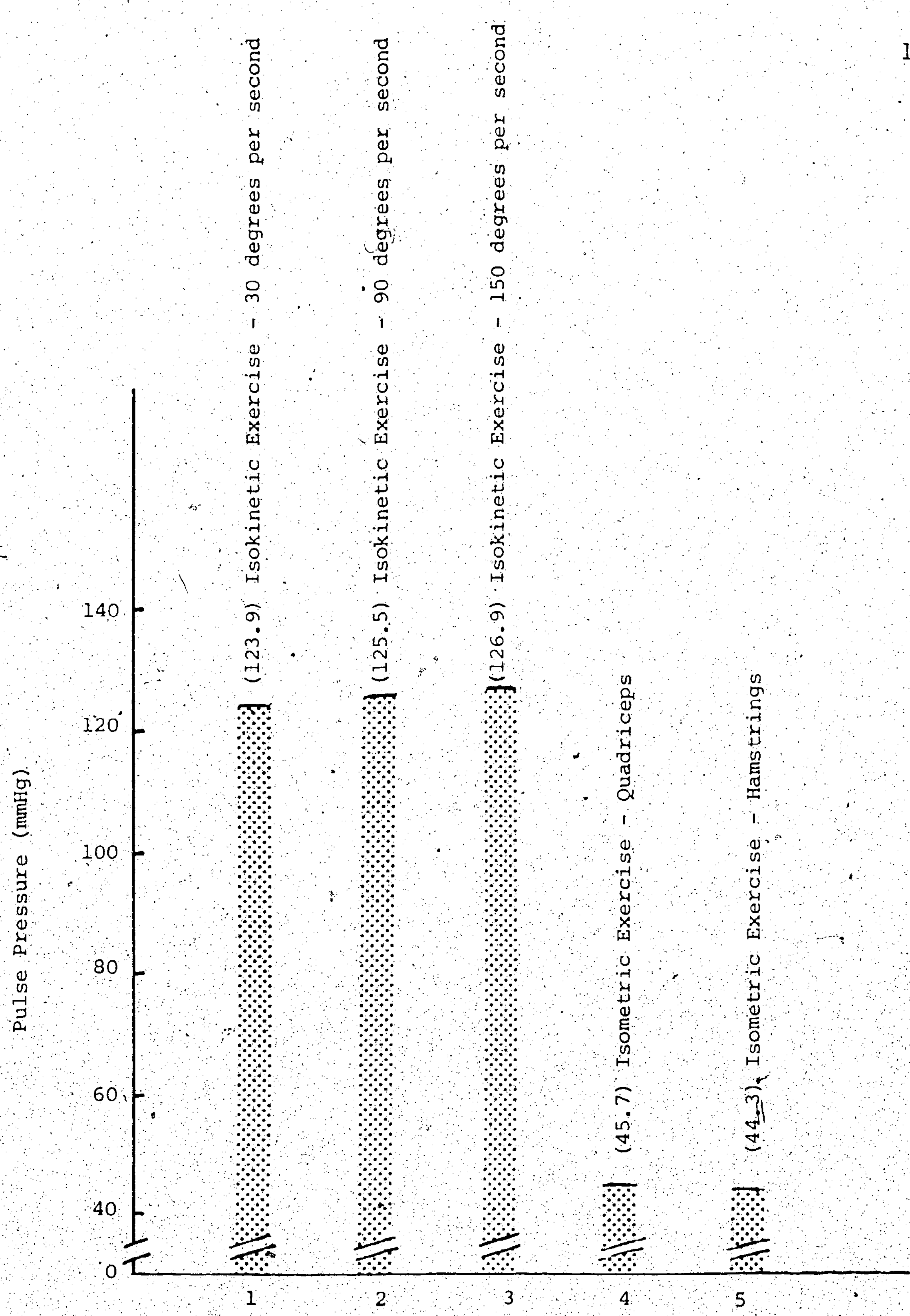

Figure 27: Pulse Pressure During Isokinetic and Maximum Isometric Exercise

Table XXXI

Significant Differences Between Means Using Scheffe Test* for Pulse Pressure During Isokinetic and Maximum Isometric Exercise

123.9 - 44.3
123.9 - 45.7
125.5 - 44.3
125.5 - 45.7
126.9 - 44.3
126.9 - 45.7

*critical value = 4.43 @ α = .05

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CHAPTER V

DISCUSSION

The purpose of the study was to determine the effect of isokinetic exercise on heart rate and blood pressure at three different speeds of movement and to determine if an isokinetic interval program had a cumulative effect on heart rate and blood pressure. In addition, the effect of isometric exercise, using quadriceps and hamstrings muscle groups, was performed to compare with the results found by previous authors. The results of the isometric and isokinetic exercises were then compared.

Effect of Isometric Exercise on Heart Rate and Blood Pressure

In both the quadriceps and hamstrings muscle groups tests, there was a statistically significant difference between trials for heart rate and a statistically significant difference in the groups/trials interaction for heart rate during the isometric rest periods. Although the interaction occurred between each of the groups, there was no definite pattern and the primary interaction was between the post-test values. These differences are due to two factors. First, following each bout of exercise, the heart rate took several minutes to return to resting or near resting levels. Secondly, for each pre-test rest period, the subjects were told that they had one minute until they had to perform an isometric test. This information to the subject caused, in most cases, an increase in heart rate prior to the exercise due to anticipation on the part of the subject.

In the quadriceps and hamstring muscle groups there was a statistically significant difference between the trials for systolic blood pressure and a statistically significant difference in the groups/trails interaction for systolic blood pressure during isometric rest periods. The differences shown were primarily between the pre-trial values and the post-trial values. Although the values obtained were statistically significant, they were not clinically important as they were within normal resting norms.

During the isometric rest periods, there was a statistically significant difference between the trials for mean blood pressure, modified tension time index and pulse pressure for both quadriceps and hamstring muscle groups. Again, although the values obtained were statistically significant, they were clinically unimportant. It was interesting to note, as was seen in

Figures 11, 12, and 13, that the values obtained for quadriceps muscle group were consistently higher than those obtained for the hamstrings muscle group. These differences may be due to the different size of the two muscle groups (1).

Both the quadriceps and hamstring muscle groups showed a statistically significant difference in heart rate during the isometric exercise bouts for the different percentages of muscle contraction. The increases shown were the result of the withdrawal of the vagal influence on the heart as well as hormonal influences and were consistent with the results reported by other authors (2,3,4,5,6,7,8,9,10).

During the isometric exercise bouts, both the quadriceps and hamstring muscle groups showed a statistically significant difference in systolic and diastolic blood pressure for the different percentages of muscle contraction. The increases shown were the result of increases in heart rate and consequently cardiac output.

The cardiac output was increased by the body in an attempt to overcome the constriction of the blood vessels and occlusion of the muscle vascular bed caused by the isometric contraction (3,4,5,6,7,8,9,10).

For the different percentages of muscle contraction during isometric exercise bouts, both the quadriceps and hamstring muscle groups showed a statistically significant difference in mean blood pressure, and modified tension time index for both muscle groups. A statistically significant difference in pulse pressure was also found for the hamstring muscle groups.

The mean blood pressure is an indication of the driving force required to drive the blood through the circulatory system. As the data indicated (Figure 16), the driving force required to push the blood through the circulatory system increased as the percentage of maximum voluntary contraction increased. This increase in driving force was necessary to overcome the constriction of the blood vessels and restriction of the muscle vascular bed caused by the isometric contraction (4,10).

The modified tension time index gives an indication of the oxygen consumption of the heart during exercise (11,12,13). As the data indicated (Figure 17), oxygen consumption probably increased as the percentage of maximum voluntary contraction increased. This increase was necessary to supply more oxygen to the heart when the heart was performing a higher level of activity (12, 13,14).

The pulse pressure is the difference between the systolic and diastolic blood pressure. The pulse pressure value which is normally about 40 mmHg can be increased by increased stroke volume (increase in systolic pressure and decrease in diastolic pressure) or by decreasing the capacitance of the arterial tree (15). Although the values obtained for pulse pressure were statistically significant for the hamstring muscle group, they were clinically unimportant as they fell within expected resting values.

<u>Effect of Isokinetic Exercise on Heart Rate and Blood Pressure</u>

During the isokinetic rest periods, there were statistically significant differences in heart rate between the three speeds of isokinetic exercise (thirty degrees per second, ninety degrees per second, and 150 degrees per second), between the rest periods, and between the trials. As well, there were statistically significant differences between the interactions of speed and rest, and rest and trials. The significant interaction between speed and rest occurred primarily between the initial rest period and the first post-exercise period. There was also an interaction between the first and second post-exercise rest periods for the medium and high speeds. The significant interaction between rest and trials occurred between the pre-exercise rest period and the first post-exercise rest period. There was also interaction between the second and third post-exercise periods. The changes that occurred were due to the heart rates not returning to the pre-test resting levels and the subjects were told that they had fifteen seconds to exercise. The heart rate was recorded just prior to exercise. Although the values were statistically significant they fell within expected resting heart rates and therefore, were clinically unimportant.

There were statistically significant differences in systolic blood pressure between the three speeds of isokinetic exercise, between the rest periods, and between the trials. As well, there were statistically significant differences between the interactions of speed and rest, and rest and trials. The significant interaction between speed and rest occurred primarily between the initial rest period and the first post-exercise period. The significant interaction between rest and trials occurred between the same two periods, namely, the pre-exercise period and the first post-exercise period. There were no statistically significant differences between any of the variables when looking at diastolic blood pressure. The differences shown were primarily between the pre-trial values and the immediate post-trial values. The post-trial values at the end of the exercise session showed the blood pressure returning to near resting levels. The results do indicate that systolic pressure remains elevated during an isokinetic interval program. These values are slightly above the range one would consider normal for resting systolic blood pressures. Figure 25 also shows a drop in diastolic blood pressure during an isokinetic interval program. The differences were not statistically significant and do fall within the range one would consider normal for resting diastolic blood pressure.

Statistically significant differences during isokinetic rest periods were found for modified tension time index and pulse pressure. No significant differences were found in mean blood pressure. The values obtained show statistical significance but clinically they are unimportant as they fall within normal resting values.

During the isokinetic exercise bouts, there were statistically significant differences in heart rate between the three speeds of isokinetic exercise (thirty degrees per second, ninety degrees per second, and 150 degrees per second), between the trials, and between the speed/trial interactions. The increases were probably due to the removal of the vagal influence on the heart and the action of hormones as was seen in isometric exercise. The continuing and increased demand for oxygen by the tissues, and the need to remove metabolites and heat would also be a factor. The heart rate increased between trials. The increased heart rate over trials is illustrated in Figure 28.

There were statistically significant differences in systolic and diastolic blood pressure between trials (Figure 19). The systolic blood pressure increased between trials and the diastolic blood pressure decreased between trials. The significant difference in blood pressure occurred between the first trial which was the pre-exercise rest period and the three exercise bouts. There was no significant difference in blood pressure between the exercise bouts. This difference was illustrated in Figure 19. The increase in systolic pressure during isokinetic exercise was due to the body's attempt to overcome the occlusion of the vascular beds within the muscle. The decrease in diastolic pressure may have been due to relaxation of one muscle group while the other muscle group contracted.

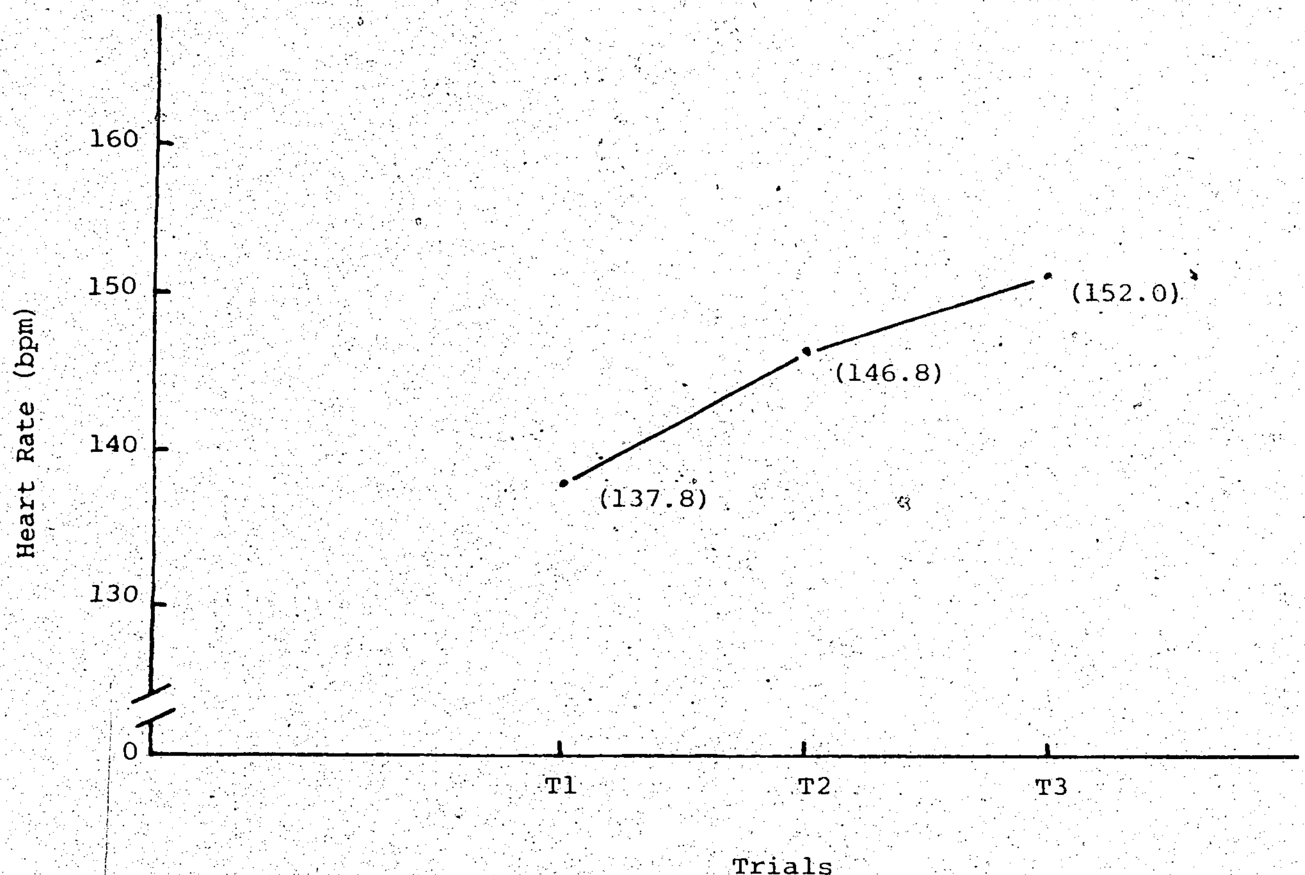

Figure 28: Increase in Heart Rate During Isokinetic Interval Exercise

The modified tension time index gives an indication of the oxygen consumption of the heart during exercise (11,12,13). As the data indicated (Figure 21 and Table 20), oxygen consumption increased with isokinetic exercise. The largest statistical difference did occur between the pre-test rest levels and the exercise levels. Trials two to four indicate isokinetic exercise at thirty degrees per second. The significant difference at this speed occurred between trial two and four indicating that with an isokinetic interval program, oxygen consumption increases with each interval of exercise.

Trials six to eight indicate isokinetic exercise at ninety degrees per second. The significant difference at this speed occurred between trial six and trial eight indicating again that oxygen consumption increases with each interval of exercise. There is also a statistically significant difference between trial two and trials seven and eight, and between trial three and trial eight indicating that as speeds of isokinetic exercise increase, oxygen consumption increases. During the isokinetic exercise, one muscle group contracted and as the contraction was maximum, the opposite or anagonist group of muscles relaxed maximally. This cyclic action could decrease the back pressure in the arterial vessels of the relaxing muscles and in the circulatory system as a whole. The cyclic action could cause a turbulence within the vessels which could prolong the pulsations within the vessel. The pulsations could cause the sound which was heard indicating a drop in diastolic pressure. It is conceivable that these sounds may be heard even if there was no constriction on the artery (16).

Statistically significant differences during isokinetic exercise bouts were found in the mean blood pressure, modified tension time index and pulse pressure.

The mean blood pressure is an indication of the driving force required to push the blood through the circulatory system. The data indicated that the only statistically significant difference occurred between trial seven and trial nine. Although this was statistically significant, it was not clinically important as the value in trial seven occurred at ninety degrees per second while the value in trial nine was the pre-test rest value prior to exercise at 150 degrees per second (Figure 20).

Trials ten to twelve indicate isokinetic exercise at 150 degrees per second. The significant differences at this speed occurred between trial ten and trials eleven and twelve. This difference indicates that oxygen consumption increases with each interval of isokinetic exercise. The statistically significant differences between trial two and trials eleven and twelve, between trial three and trials eleven and twelve, and between trial six and trials eleven and twelve indicate that as the speed of isokinetic exercise increases, the oxygen consumption increases.

The pulse pressure is the difference between the systolic and diastolic blood pressure (15). As the data indicated (Figure 22 and Table 21), the pulse pressure increased during isokinetic exercise. The largest statistical difference occurred between the pre-test rest levels and the exercise levels. Trials two to four indicate isokinetic exercise at thirty degrees per second. Although the values between the first and third exercise bout were not statistically significant, Figure 22 does indicate that pulse pressure does increase with each exercise bout.

The data for ninety degrees per second (trial five to trial eight) and 150 degrees per second (trial nine to trial twelve) indicate similar results to isokinetic exercise at thirty degrees per second (trial one to trial four). Unlike oxygen consumption as indicated by the modified tension time index, the pulse pressure appears to level off for each bout of exercise as the speed of isokinetic exercise increases.

Comparison of Effect of Isometric and Isokinetic Exercise on Heart Rate and Blood Pressure

Statistically significant differences in heart rate were found between isokinetic exercise and maximum isometric exercise. The data indicates that as the speed of isokinetic exercise slows, the heart rate approaches the heart rate of isometric exercise although the differences are statistically significant (Figure 23). As the speed of isokinetic exercise increases, it appears that the heart rate is levelling off and is reaching a maximum level.

When viewing systolic blood pressure, there is a statistically significant difference between isokinetic exercise and isometric exercise. This difference may be due to the contract-relax cyclical sequence of isometric exercise. There is no statistical significance between the different speeds of isokinetic exercise or between the two isometric (quadriceps/hamstrings) contractions (Figure 24). The data indicates that systolic blood pressure increases to a greater extent with isokinetic exercise than it does with isometric exercise.

There is a statistically significant difference in diastolic blood pressure between isokinetic exercise and isometric exercise. This difference, again, may be due to the contract-relax cyclical sequence of isokinetic exercise. Also, the "noise" set up within the vascular walls due to the strenuous movement during the exercise may have led to an erroneous reading which physiologically couldn't be prevented (16). This reading could lead to erroneous readings of mean blood pressure, and pulse pressure as well. There was also a statistically significant difference between the slowest isokinetic speed (thirty degrees per second) and the two faster speeds (ninety and 150 degrees per second). This difference again may have been due to the "noise" within the vascular walls.

There is a statistically significant difference in mean blood pressure, modified tension time index, and pulse pressure between isokinetic exercise and isometric exercise. The data indicates that mean blood pressure is less during isokinetic exercise indicating that the force necessary to drive the blood through the circulatory system is less with isokinetic exercise. This decrease may be due to the pumping action of the muscles as they contract and relax during isokinetic exercise.

Modified tension time index is greater during isokinetic exercise than during isometric exercise. This higher value indicates that myocardial work and hence oxygen consumption increased more during isokinetic exercise than during isometric exercise.

Pulse pressure is greater during isokinetic exercise than during isometric exercise. This higher value is due to the increase in systolic blood pressure while the diastolic blood pressure drops during isokinetic exercise. During isometric exercise, both systolic and diastolic blood pressure rise.

The data and its statistical analysis indicates that isokinetic exercise places a greater stress on the cardiovascular system than does isometric exercise. For this reason, when one uses an isokinetic device to test or exercise a person or patient, one must be sure the subject has no known cardiovascular problems. It would appear that both isometric and isokinetic exercise place a relatively high stress on the cardiovascular system and therefore should be used with care both for exercising and testing. Further research must be carried out to determine the effects of isokinetic exercise on different age groups, different sexes, and on subjects with known cardiovascular problems.

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CHAPTER VI

SUMMARY AND CONCLUSIONS

The purpose of this study was to determine the effect of isokinetic exercise on heart rate and blood pressure at three different speeds of movement and to determine if an isokinetic interval program had a cumulative effect on heart rate and blood pressure. In addition, the quadriceps and hamstring muscle groups were tested isometrically on the Cybex II isokinetic apparatus. The effects of isometric exercise on heart rate and blood pressure were observed and compared with the results found in previous studies. A sample of twenty-four subjects was studied.

The testing procedure involved testing four increments of isometric strength on one day (maximum voluntary contraction (MVC), seventy percent MVC, thirty percent MVC, and ten percent MVC), and testing three different speeds (thirty degrees per second, ninety degrees per second, and 150 degrees per second) on the isokinetic apparatus (Cybex II isokinetic apparatus) on three consecutive days. The order of exercise was determined by a Latin Square Design.

The data was analyzed by means of one-way, two-way, and three-way analysis of variance. Significant measurements at the .001 level of confidence were subjected to a Tukey or Scheffe Test.

Within the restrictions of the study, the null hypothesis was rejected at the .001 level of confidence for isokinetic exercise at all three speeds used - thirty degrees per second, ninety degrees per second, and 150 degrees per second. The data from the study allowed the following conclusions:

1. Heart rate increased with both isometric and isokinetic exercise. This increase in heart rate was greater for isokinetic exercise than isometric exercise.
2. Systolic blood pressure increased with both isometric and isokinetic exercise. This increase in systolic blood pressure was greater for isokinetic exercise than isometric exercise.
3. Diastolic blood pressure increased with isometric exercise and fell with isokinetic exercise.
4. Mean blood pressure was higher during isometric exercise than during isokinetic exercise.
5. Modified tension time index was higher during isokinetic exercise than during isometric exercise indicating more myocardial work and hence more oxygen consumption during isokinetic exercise.

6. Modified tension time index increased with each bout of isokinetic exercise at a specific speed indicating a cumulative effect of isokinetic exercise on oxygen consumption of the heart.
7. Modified tension time index increased with each increase in speed of isokinetic exercise indicating more myocardial work and hence an increase in oxygen consumption as the speed of isokinetic exercise increases.
8. Pulse pressure was greater during isokinetic exercise than during isometric exercise.
9. Pulse pressure increased with isokinetic exercise.

The results of this study compare the effect of two exercise modes on heart rate and blood pressure. Isometric exercise has, for some time, been known to increase the stress on the cardiovascular system which may be detrimental to people with cardiovascular problems. The data from this study concerning the second mode of exercise (isokinetic exercise) implies that this form of exercise may place an even greater stress on the cardiovascular system.

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APPENDIX A

INFORMATION TO POTENTIAL SUBJECTS FORM

Information to Potential Subjects

The testing sessions for each subject will take approximately three hours spread over four attendances. The first session will take one hour to one and a half hours and the other sessions will be of equal duration. The sessions will be on four consecutive days at the same time each day. No pre-training is required for participation in this study which is concerned with the effect of isokinetic exercise on human heart rate and blood pressure.

If you agree to participate in this study you will be asked not to eat, smoke, or drink for a period of four hours prior to your arrival in the testing laboratory. You will also be asked to perform no exercise other than walking for at least thirty minutes prior to the test.

When you arrive in the laboratory, you will be asked to sit in a special isokinetic chair and you will have straps placed around your right ankle to connect you to the isokinetic dynamometer, and straps around your right thigh and waist to stabilize you for the test. Two electrocardiogram leads will be attached to your chest by means of adhesive tape and a blood pressure cuff will be placed around your left upper arm.

During the first test session, you will be asked to perform eight isometric contractions - maximum voluntary contraction (MVC), 70% MVC, 30% MVC and 10% MVC - four for the quadriceps and four for the hamstrings - with the last three contractions being in random order. You will be asked to try and hold each contraction for up to 3 minutes.

During the subsequent three visits, you will be asked to perform an isokinetic interval training program at three randomly assigned speeds (30°/sec, 90°/sec & 150°/sec). You will be positioned in the Cybex apparatus as before and the electrocardiogram leads and blood pressure cuff will be attached as before. You will then be asked to flex and extend your knee as fast and as hard as you can for one minute, rest for three minutes, and repeat the one minute exercise, and three minutes rest cycle two more times. On each of the three visits, you will be asked to do one of the three speeds.

While doing the exercises and on completion of each exercise session, you may find that the leg feels very tired or weak. This sensation is only temporary and will disappear within two hours.

The purpose of this information is to assure that potential subjects are informed of, and fully understand the procedures and possible after-effects to which they will be exposed if they agree to participate in the study. If you have any questions, please discuss these with the investigator before you sign the Informed Consent Form.

Should you so choose, you may end your participation in this study at any time without being required to explain your reasons for withdrawal.

All personal information given to the investigator during this study will be regarded as confidential.

APPENDIX B

CONSENT FORM FOR RESEARCH STUDY

Informed Consent Form for Research Study

I, ______________________________, hereby give my consent to participate in a research study on the effect of isokinetic exercise on heart rate and blood pressure, the general plan of which has been explained to me.

I fully understand as it has been explained to me that by notice given to the undersigned investigator that I may withdraw from this research project any time that I may elect to do so.

______________________ Date

______________________ Participant's Signature

I hereby certify that I have given to the above individual an explanation of the contemplated study and any possible side effects.

______________________ Investigator's Signature

APPENDIX C

PERSONAL DATA FORM

TO: Each person who has agreed to participate in the study to examine the effects of isokinetic exercise on heart rate and blood pressure.

FROM: David Magee

Thank you for being willing to participate in this study.

In order that the results of the study shall be as valid as possible, I would be grateful if you would complete the details below. I assure you that these personal details will not be disclosed at any time to any third person in such a way that you could be identified from them.

PERSONAL DATA FORM

Name: Age:

Address:

Phone Number:

Please indicate by answering YES or NO in the appropriate column whether you or any member of your immediate family (parents, brothers, sisters) have, to the best of your knowledge, ever suffered from any of the following medical problems:

	SELF	FAMILY
Heart Disease		
Thrombosis		
Varicose Veins		
Swollen Ankles		
Hypertension		
Hypotension		
Respiratory Conditions		

Do you smoke? ________. If so, approximately how many per day? __________.

Are you presently taking medication for any reason?

_______________.

If so, what medication and for what condition?

____

____

Date: ______________ Signed: ______________________________

APPENDIX D

APPOINTMENT SHEET

WEEK OF: ________

TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
11:00						
12:30						
2:00						
3:30						
5:00						
6:30						
8:00						
9:30						

APPENDIX E

CONFIRMATION LETTER

TO: Volunteers who have agreed to participate in the study to examine the effects of isokinetic exercise on heart rate and blood pressure.

Dear :

Thank you for being willing to act as a subject in this study. It has been possible to arrange your test appointments at the times suggested by you.

Your appointments will be on:

____________________ at ____________________

____________________ at ____________________

____________________ at ____________________

____________________ at ____________________

I would be grateful if you would let me know in advance if, for any reason you are unable to attend for this appointment. You may get in touch with me by leaving a message in my mail box at Corbett Hall or by telephoning 434-6547 or 439-4181 and leaving a message.

You should feel free to invite one colleague to accompany you to the test sessions if you so choose. One of your friends who is not a subject may be glad of the opportunity to see what is being done.

You are reminded that you should not eat, drink, or smoke for a period of four hours prior to the start of your test session.

Please wear a P.E. kit for the test sessions.

I look forward to seeing you.

Yours sincerely,

David J. Magee

APPENDIX F

APPOINTMENT REMINDER FORM

TO: Volunteers who have agreed to participate in the study to examine the effects of isokinetic exercise on heart rate and blood pressure.

Dear :

This notice is just a reminder that you are scheduled for testing next week.

Your appointments as arranged were:

____________________ at ____________________

____________________ at ____________________

____________________ at ____________________

____________________ at ____________________

You are reminded that you should not eat, drink, or smoke for a period of four hours prior to the start of your test session.

Please wear a P.E. kit for the test sessions.

I look forward to seeing you.

Yours sincerely,

David J. Magee

APPENDIX G

CONVERSION CHART

Maximum Voluntary Contraction (MVC) to Percentage Maximum Voluntary Contraction

MVC (ft.lb)	70% MVC (ft.lb)	30% MVC (ft.lb)	10% MVC (ft.lb)
11	8	3	1
12	8	4	1
13	9	4	1
14	10	4	1
15	11	5	2
16	11	5	2
17	12	5	2
18	13	5	2
19	13	6	2
20	14	6	2
21	15	6	2
22	15	7	2
23	16	7	2
24	17	7	2
25	18	8	3
26	18	8	3
27	19	8	3
28	20	8	3
29	20	9	3
30	21	9	3
31	22	9	3
32	22	10	3
33	23	10	3
34	24	10	3
35	25	11	4
36	25	11	4

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
37	26	11	4
38	27	11	4
39	27	12	4
40	28	12	4
41	29	12	4
42	29	13	4
43	30	13	4
44	31	13	4
45	32	14	5
46	32	14	5
47	33	14	5
48	34	14	5
49	34	15	5
50	35	15	5
51	36	15	5
52	36	16	5
53	37	16	5
54	38	16	5
55	39	17	6
56	39	17	6
57	40	17	6
58	41	17	6
59	41	18	6
60	42	18	6
61	43	18	6
62	43	19	6
63	44	19	6

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
64	45	19	6
65	46	20	7
66	46	20	7
67	47	20	7
68	48	20	7
69	48	21	7
70	49	21	7
71	50	21	7
72	50	22	7
73	51	22	7
74	52	22	7
75	53	23	8
76	53	23	8
77	54	23	8
78	55	23	8
79	55	24	8
80	56	24	8
81	57	24	8
82	57	25	8
83	58	25	8
84	59	25	8
85	60	26	9
86	60	26	9
87	61	26	9
88	62	26	9
89	62	27	9
90	63	27	9

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
91	64	27	9
92	64	28	9
93	65	28	9
94	66	28	9
95	67	29	10
96	67	29	10
97	68	29	10
98	69	29	10
99	69	30	10
100	70	30	10
101	71	30	10
102	71	31	10
103	72	31	10
104	73	31	11
105	74	32	11
106	74	32	11
107	75	32	11
108	76	32	11
109	76	33	11
110	77	33	11
111	78	33	11
112	78	34	11
113	79	34	11
114	80	34	11
115	81	35	12
116	81	35	12

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
117	82	35	12
118	83	35	12
119	83	36	12
120	84	36	12
121	85	36	12
122	85	37	12
123	86	37	12
124	87	37	12
125	88	38	13
126	88	38	13
127	89	38	13
128	90	38	13
129	90	39	13
130	91	39	13
131	92	39	13
132	92	40	13
133	93	40	13
134	94	40	13
135	95	41	14
136	95	41	14
137	96	41	14
138	97	41	14
139	97	42	14
140	98	42	14

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
141	99	42	14
142	99	43	14
143	100	43	14
144	101	43	14
145	102	44	15
146	102	44	15
147	103	44	15
148	104	44	15
149	104	45	15
150	105	45	15
151	106	45	15
152	106	46	15
153	107	46	15
154	108	45	15
155	109	47	16
156	109	47	16
157	110	47	16
158	111	47	16
159	111	48	16
160	112	48	16
161	113	48	16
162	113	49	16
163	114	49	16
164	115	49	16
165	116	50	17
166	116	50	17
167	117	50	17

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
168	118	50	17
169	118	51	17
170	119	51	17
171	120	51	17
172	120	52	17
173	121	52	17
174	122	52	17
175	123	53	18
176	123	53	18
177	124	53	18
178	125	53	18
179	125	54	18
180	126	54	18
181	127	54	18
182	127	55	18
183	128	55	18
184	129	55	18
195	130	56	19
186	130	56	19
187	131	56	19
188	132	56	19
189	132	57	19
190	133	57	19
101	134	57	19
192	134	58	19
193	135	58	19

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
194	136	58	19
195	137	59	20
196	137	59	20
197	138	59	20
198	139	59	20
199	139	60	20
200	140	60	20
201	141	60	20
202	141	61	20
203	142	61	20
204	143	61	20
205	144	62	21
206	144	62	21
207	145	62	21
208	146	62	21
209	146	63	21
210	147	63	21
211	148	63	21
212	148	64	21
213	149	64	21
214	150	64	21
215	151	65	22
216	151	65	22
217	152	65	22
218	153	65	22
219	153	66	22
220	154	66	22

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
221	155	66	22
222	155	67	22
223	156	67	22
224	157	67	22
225	158	68	23
226	158	68	23
227	159	68	23
228	160	68	23
229	160	69	23
230	161	69	23
231	162	69	23
232	162	70	23
233	163	70	23
234	164	70	23
235	165	71	24
236	165	71	24
237	166	71	24
238	167	71	24
239	167	72	24
240	168	72	24
241	169	72	24
242	169	73	24
243	170	73	24
244	171	73	24
245	172	74	25
246	172	74	25
247	173	74	25

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
248	174	74	25
249	174	75	25
250	175	75	25
251	176	75	25
252	176	76	25
253	177	76	25
254	178	76	25
255	179	77	26
256	179	77	26
257	180	77	26
258	181	77	26
259	181	78	26
260	172	78	26
261	173	78	26
262	173	79	26
263	174	79	26
264	185	79	26
265	186	80	27
266	186	80	27
267	187	80	27
268	188	80	27
269	188	81	27
270	189	81	27
271	190	81	27
272	190	82	27
273	191	82	27

MVC(ft.lb)	70% MVC(ft.lb)	30% MVC(ft.lb)	10% MVC(ft.lb)
274	192	82	27
275	193	83	28
276	193	83	28
277	194	83	28
278	195	83	28
279	195	84	28
280	196	84	28
281	197	84	28
282	197	85	28
283	198	85	28
284	199	85	28
285	200	86	29
286	200	86	29
287	201	86	29
288	202	86	29
289	202	87	29
290	203	87	29
291	204	87	29
292	204	88	29
293	205	88	29
294	206	88	29
295	207	89	30
296	207	89	30
297	209	89	30
298	209	89	30
299	209	90	30
300	210	90	30

APPENDIX H

CALIBRATION CHART - ISOKINETIC APPARATUS

CYBEX CALIBRATION

RECORDER SCALE SELECTOR	LEVER ARM Inches*	WEIGHT Pounds	CALIB. TORQUE INPUT Foot Pounds	GRAPH RECORDING PEAK
360	30	70	180	5 Major Divisions
180	31	32.5	90	5 Major Divisions
30	33	5	20	20 Major Divisions

CALIBRATION POINTS (mid-scale)

360 Scale *30" 70 lbs on arm yields 180 ft lbs (5 Major Divisions)

180 Scale *31" 32.5 lbs on arm yields 90 ft lbs (5 Major Divisions)

30 Scale *33" 5 lbs on arm yields 20 ft lbs (20 Major Divisions)

*Distance from center of CYBEX input shaft to center of T tube (lever arm length).

Procedure:

1. Select Recorder Range scale (0-30, 0-180 or 0-360).
2. With Speed Selector ON at 5 RPM and Recorder ON but no torque applied to input shaft:
   a) Select #4 position on Damping control.
   b) Select slow chart speed (2mm/sec).
   c) Align stylus with baseline of chart paper grid using Zero Adjust control.
   d) Check to see baseline does not shift when range scale is changed. Plus or minus small division of change on the 30 scale is acceptable. Baseline shift can be corrected by adjusting with a small screwdriver the potentiometer behind the cap marked ZERO on the front vertical panel of the recorder case.
3. Attach proper amount of disc weights to T bar as per above calibration. Check accuracy of weights first as a 25 lb. weight may be off as much as 1/2 lb. from its indicated value. A 2 1/2 lb. weight may be off 1/4 lb. Use correct weight value.

4. Dynamic calibration is done by manually lifting weighted T bar to vertical position above dynamometer, then allowing it to swing down until weights contact the floor. As weighted arm passes the horizontal, it is applying the specified torque. The graph recording will show this value as the maximum point on the curve. If this point is above or below the correct torque value, adjust the recorder and make it read the correct value by turning the appropriate (30, 180, 360) potentiometer behind the plug on the front case of the recorder using a small screw-driver. Turning the pot clockwise will decrease the reading and counterclockwise will increase it.

APPENDIX I

ISOMETRIC LABORATORY WORK SHEET

ISOMETRIC LABORATORY WORKSHEET

SUBJECT NUMBER: ______________

HEART RATE (bpm)	5 Minute Rest Period	MVC 1 Minute	5 Minute Rest Period	% age MVC 1 Minute	5 Minute Rest Period	% age MVC 1 Minute	5 Minute Rest Period	% age MVC 1 Minute	5 Minute Rest Period
QUADRICEPS	1	1	1	1	1	1	1	1	1
	2		2		2		2		2
	3		3		3		3		3
	4		4		4		4		4
	5		5		5		5		5
HAMSTRINGS	1	1	1	1	1	1	1	1	1
	2		2		2		2		2
	3		3		3		3		3
	4		4		4		4		4
	5		5		5		5		5
Blood Pressure (mmHg)									
QUADRICEPS	1	1	1	1	1	1	1	1	1
	2		2		2		2		2
	3		3		3		3		3
	4		4		4		4		4
	5		5		5		5		5
HAMSTRINGS	1	1	1	1	1	1	1	1	1
	2		2		2		2		2
	3		3		3		3		3
	4		4		4		4		4
	5		5		5		5		5

APPENDIX J

ISOKINETIC LABORATORY WORK SHEET

ISOKINETIC LABORATORY WORKSHEET

Subject Number: ____________

		5 Minute Rest Period	1 Minute Exercise	3 Minute Rest Period	1 Minute Exercise	3 Minute Rest Period	1 Minute Exercise	Rest Period (Return to Resting Value)	
SESSION ONE	Heart Rate (bpm)	1	1	1	1	1	1	1	6
		2		2		2		2	7
		3		3		3		3	8
		4						4	9
SPEED:		5						5	10
	Blood Pressure (mmHg)	1	1	1	1	1	1	1	6
		2		2		2		2	7
		3		3		3		3	8
		4						4	9
		5						5	10
SESSION TWO	Heart Rate (bpm)	1	1	1	1	1	1	1	6
		2		2		2		2	7
		3		3		3		3	8
		4						4	9
SPEED:		5						5	10
	Blood Pressure (mmHg)	1	1	1	1	1	1	1	6
		2		2		2		2	7
		3		3		3		3	8
		4						4	9
		5						5	10
SESSION THREE	Heart Rate (bpm)	1	1	1	1	1	1	1	6
		2		2		2		2	7
		3		3		3		3	8
		4						4	9
SPEED:		5						5	10
	Blood Pressure (mmHg)	1	1	1	1	1	1	1	6
		2		2		2		2	7
		3		3		3		3	8
		4						4	9
		5						5	10

APPENDIX K

LATIN SQUARE DESIGN

FOR

PERCENTAGE MAXIMUM VOLUNTARY CONTRACTIONS

AND

SPEEDS OF ISOKINETIC EXERCISE

70% MVC	30% MVC	10% MVC
A	B	C
B	C	A
C	A	B
A	B	C
B	C	A
C	A	B

etc

150 degrees/second	90 degrees/second	30 degrees/second
A	B	C
B	C	A
C	A	B
A	B	C
B	C	A
C	A	B

etc

(from B.J. Winer, Statistical Principles in Experimental Design, 2nd edition, 1971, pg. 685)

APPENDIX L

Raw Data

INDEX

1. Raw data for isokinetic rest-heart rate
   Read 062; 058; 060; 075; etc.

2. Raw data for isokinetic rest-blood pressure
   Read 130/088 (systolic/diastolic); 130/086; 130/090; etc.

3. Raw data for isokinetic exercise-heart rate
   Read 060; 104; 102; 100; 065; etc.

4. Raw data for isokinetic exercise-blood pressure
   Read 130/88 (systolic/diastolic); 210/66; 200/72; etc.

5. Raw data for Isometric rest-quadriceps-heart rate
   Read 070; 087; 078; 080

6. Raw data for isometric rest-quadriceps-blood pressure
   Read 122/082 (systolic/diastolic); 122/084; 120/084; etc.

7. Raw data for isometric rest-hamstrongs-heart rate
   Read 077; 080; 070; 082; 077

8. Raw data for isometric rest-hamstrings-blood pressure
   Read 120/084 (systolic/diastolic); 116/084; 118/084; etc.

9. Raw data for isometric exercise-quadriceps-heart rate
   Read 110; 087; 078; 090

10. Raw data for isometric exercise-quadriceps-blood pressure
    Read 140/110 (systolic/diastolic); 130/100; 120/88; etc.

11. Raw data for isometric exercise-hamstrings-heart rate
    Read 100; 096; 085; 085.

12. Raw data for isometric exercise-hamstrings-blood pressure
    Read 140/110 (systolic/diastolic); 142/110; etc.

13. Raw data for isokinetic rest
    (a) mean blood pressure (V28-V36)
    (b) modified tension time index (V37-V45)
    (c) pulse pressure (V46-V54)

14. Raw data for isokinetic exercise
    (a) mean blood pressure (V37-V48)
    (b) modified tension time index (V49-V60)
    (c) pulse pressure (V61-V72)

15. Raw data for isometric rest-quadriceps
    (a) mean blood pressure (V16-V20)
    (b) modified t-nsion time index (V21-V25)
    (c) pulse pressure (V26-V30)

16. Raw data for isometric rest-hamstrings
    (a) mean blood pressure (V16-V20)
    (b) modified tension time index (V21-V25)
    (c) pulse pressure (V26-V30)

17. Raw data for isometric exercise-quadriceps
    (a) mean blood pressure (V13-V16)
    (b) modified tension time index (V17-V20)
    (c) pulse pressure (V21-V24)

18. Raw data for isometric exercise-hamstrings
    (a) mean blood pressure (V13-V16)
    (b) modified tension time index (V17-V20)
    (c) pulse pressure (V21-V24)

19. Raw data for comparison of isokinetic and isometric exercise-heart rate

20. Raw data for comparison of isokinetic and isometric exercise- systolic blood pressure

21. Raw data for comparison of isokinetic and isometric exercise- diastolic blood pressure

22. Raw data for comparison of isokinetic and isometric exercise- mean blood pressure

23. Raw data for comparison of isokinetic and isometric exercise- modified tension time index

24. Raw data for comparison of isokinetic and isometric exercise - pulse pressure

1. Raw data for isokinetic rest-heart rate
Read 062; 058; 060; 075; etc.

1	062058060075063065073065070070060067065068061059062062
2	062065067085075075083068075083075070070078073065060072
3	060063065075065070078073072080074068074072074070070076
4	065073067075062110102093100096075090080090085080090090
5	058060060060060095060063095090083068085070080080073080
6	064060060083075095115087115095097092090085090076087095
7	057055055070065080074065073070060065057062061070058060
8	054048058070065063075072072072070073060062065060059062
9	052055052075062070070070085097068062070070068060065062
10	050055055070058083065067082073056060065054053061062058
11	044035055080080095105090110100087078076075075074076073
12	057043044062061054073068078087073070072065062063070068
13	054058058073070060098060075076072073063068065065063066
14	053057053083072087078069078086075097075078068070065075
15	055062050083068075085075088092094090083075065072063070
16	056055055065055065070063065072065070070070067072073065
17	063058070075075075095077090093080080083080080078080078
18	055060050082072080090095100103093085084085083085085082
19	085090073088070070075075110077090080077075078080073074
20	055055080080065107070087112075068070075078082068085085
21	083070074060085085095098118090090084085086087086084085
22	047065063068070075077060057075070064065063065075068058
23	075073075090093102112095110108100092087087090083085085
24	055063063085072090092087100100080085080078070073075080
25	070070070080070087087076088090078070080075075085085085
26	067080070090075075075075085083075090075075085085078086
27	070073070080075078088080085078080085085095085090080081
28	071057062075060065093064090100075075080075070070065065
29	062057060085083088101095095096094086077074073078075077
30	066066053087078080093087090096085078076080075080076073
31	058066056067065090072080075090085075078080080082083084
32	045047060078065090075075095085085083087083078083083080
33	042044045068082090089080088100090090080078083080080080
34	086082086098098090095090090103090095095088100100101085
35	065070075097085090100080097100085087087092085085095090
36	090085078100095095112108106116100105100103095095095087
37	063065060058060065063065070067062068065070065066070065
38	082080080090080080070085090090095080090080087085077070
39	062066066078058070077070085084083072087067070070072080
40	045048047053047070063071070065055050060055055060055055
41	047045055048060055060068073082070060070067075062060062
42	050055047082050065080065083070078060065070070075085055
43	065055060086070070080070085075078070060065070070057065
44	060065060080060075078074093080080062070055055053057055
45	065052050075065072065056065070057058055055065060060056
46	052050055060060060052061084065060078070078090078065065
47	053052055082058085085072087078075072072075068075068075
48	050049053080080090085093096095095093085083080085075080
49	080070085090085085087085083083080080080083080080085
50	070065060073070080080073086082085080080076083080080080
51	070070068070068083085083093087086080082085087085087087
52	050063048058057098087088102103087095084080083077090084
53	080055060110100115115108125125123107107104100100097097
54	072064056115090117122112123125113111115106105110120105
55	043037048055042062045055060075055057056055055055045047
56	053055050055058060074065055080063057073055044062065060
57	045047037063052067070055054078048058060060060060057055
58	062060065070065070067069063070060060065065066063068070
59	065065060090070078081075080093080080070070070065065070
60	060062059078078073083080090085085077073078072070067075

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61    045042044050075080080049085096080065067070062070075075
62    057047040090080095095090095107090080078075076077072075
63    053047060090053080105090100093095074083075077073070076
64    092085077102077105100090105112094100095095095095097095
65    087090085107104143127113126130117115110107105100110105
66    080077077103083097115105120127110105102108100108103103
67    047052050052045060063060065080070073070073065063073057
68    045045047087060073105085087112090097085065085085085090
69    050052055090070092105100103123107096093093095095090105
70    106095115120112125135125136145125118117115110110108107
71    085070075112087112120110113124107093100090095090100090
72    076053060120108110125120123140112108107105095100095100
END OF FILE
```

2. Raw data for isokinetic rest-blood pressure
Read 130/088 (systolic/diastolic); 130/086; 130/090; etc.

1	130088	130086	130090	140078	132084	130088	138078	134080	126086
2	140070	142082	130086	136084	128088	128086	126086	130086	130086
3	115078	112080	114080	130074	130078	128070	140070	124076	122076
4	136076	130074	122076	120078	122076	122076	120080	120080	118080
5	110078	112076	112078	132068	118076	115076	132076	128076	138076
6	144068	136078	128074	128076	124080	124076	124076	120076	118070
7	120078	118080	118080	152068	140070	132074	158070	140076	138078
8	164070	142076	132076	132080	132078	128078	122076	118074	122070
9	120086	120086	120086	164076	150078	136080	172074	150080	148078
10	180068	168072	140080	136078	130076	132076	128072	120080	122080
11	126088	126088	120088	152080	142086	140080	178076	164086	150088
12	184072	156086	152088	140088	130084	130080	130082	128080	120080
13	130082	128084	130080	160090	140088	142088	178092	158088	158088
14	190076	160082	148084	142088	142084	132082	138088	130088	130088
15	120088	118088	120090	172080	160080	142082	182084	166088	154088
16	182088	160086	148088	146088	138088	138090	136088	134088	130090
17	124090	126092	128090	170080	156090	150090	190088	170092	170090
18	190092	170090	152090	142088	142084	142088	138086	132088	132082
19	125068	124068	124068	168040	146060	148068	162040	158060	150060
20	160052	148060	140060	136060	136062	128062	128068	128062	128066
21	130076	132082	132080	170020	170020	170025	178010	178015	174015
22	178010	166015	160030	156050	152056	150056	142058	140064	140066
23	128080	130080	130078	156050	144054	120066	160042	158040	148042
24	170010	152044	148050	144050	138060	140066	136070	132070	130072
25	112080	116078	114076	120076	120072	124080	136064	120070	120070
26	158072	130072	122076	120076	120078	118078	112078	114076	112078
27	128082	126084	126084	138078	140084	136086	146080	138084	138080
28	148072	150072	132082	132084	134080	130082	130084	130084	128082
29	114076	116078	112078	148068	128070	132078	148068	140072	126084
30	148076	140070	140070	140072	138070	130070	128070	120070	120072
31	124100	126096	128100	164090	158084	136084	170084	150090	140092
32	170088	150094	150094	146100	138096	140100	142098	142102	138100
33	122080	124088	122080	166076	150092	140080	160092	150090	152090
34	180090	160080	158084	152086	150086	148084	148084	138084	140088
35	130084	130086	130086	162082	160080	160080	177086	170080	162084
36	184080	170084	152088	150082	150086	150080	146086	144086	144084
37	116084	112088	112084	140072	138080	142080	142088	132080	132084
38	146082	142086	138090	130088	132088	128090	128090	124088	124088
39	122080	122080	120080	144064	140068	140080	158060	148080	144080
40	168060	140070	136070	136080	136078	132080	128080	126080	124080
41	118090	120088	118090	155076	136078	132082	152080	132082	132088
42	148074	138088	130076	124080	122082	118084	118080	116084	112086
43	118088	118084	118078	120068	116072	118072	142078	126078	122080
44	130080	136080	124082	124080	124080	126080	124080	122082	122084
45	116084	118084	120088	154976	150078	136080	166076	150076	130080
46	146076	130080	130086	128086	124084	124080	124080	124076	124084
47	118084	118078	118082	144080	138080	140082	150072	132086	138080
48	142072	128078	126080	120078	120070	116078	112078	112076	112072
49	138092	132092	132094	144076	140088	132088	140080	120080	120088
50	142084	132088	122084	128084	124084	124084	120084	118084	116088
51	130100	130100	124092	135072	120080	126080	122088	128084	124080
52	140080	136080	124084	124080	120078	120082	120086	120086	120088
53	128096	124090	128096	138080	132080	132082	156088	136084	136088
54	150080	130082	130080	130082	128080	126084	122084	120084	120086
55	110064	112066	112064	120068	116068	120070	128072	122078	118080
56	138064	126070	118072	118072	116072	110070	116070	120070	122074
57	110075	110076	110076	140064	128068	126072	156076	140078	138078
58	162-72	140078	136076	128074	126070	118070	118070	112072	112072
59	106074	106076	104076	140070	128072	128070	150068	138064	130066
60	144070	138070	130072	120072	118068	110066	106070	106070	106068

61	130084	130086	132086	160074	152076	156078	178078	158076	154072
62	178076	162080	144082	142080	142074	140074	138068	134070	134070
63	116074	[illegible]	118076	150062	150070	138066	174060	160064	154070
64	182070	160072	150072	146070	134066	132068	134074	132074	130070
65	130084	128086	128086	166072	152076	150086	180052	166080	156080
66	174072	150080	146076	142076	134072	130070	124070	122070	124070
67	118082	122084	120080	156080	132088	130088	144080	134082	134080
68	158084	142088	140088	140088	136088	132086	130086	130084	126084
69	120088	120088	122088	138084	136086	132086	154084	140082	140084
70	156088	140088	140086	138082	130084	130082	126084	120084	124086
71	115086	112082	114082	150070	138070	130074	162078	140084	138084
72	158086	144084	138082	132088	132084	132080	128080	126078	122080
73	120084	118084	118084	146070	140076	138074	140064	132070	120070
74	142064	125073	122078	118076	118076	124080	120080	118080	118080
75	116074	116076	116070	132040	126058	126060	160040	134050	130056
76	150048	142056	136060	130060	122062	120060	120070	118068	110072
77	120084	120084	120084	138062	136070	130078	138046	124066	124076
78	138050	136060	136068	130070	120070	120074	116078	112080	110080
79	110078	108078	104078	124080	118080	114080	138078	126080	120082
80	136070	132080	132078	128078	122072	122078	122080	120080	116080
81	106074	104076	106078	138060	130072	126070	152068	130070	134070
82	154060	140068	130074	124074	120072	118078	114076	114074	114072
83	108080	108080	110082	146070	157068	126068	152076	144078	140080
84	152068	140076	132074	124076	118076	112072	114070	112072	112074
85	120070	110070	110064	148058	142060	130064	148060	134066	134072
86	150052	136068	130066	132066	130068	128068	124070	120072	120068
87	120076	118074	112074	156040	150042	148040	168040	152042	148052
88	152056	144064	140064	136066	130068	120068	120068	120070	122072
89	124072	122072	122074	160040	155056	154060	170048	160050	150060
90	168048	150052	158058	146060	140064	140064	138064	134064	128064
91	116078	116076	116076	144074	130080	130078	152072	140080	136080
92	154068	132070	132074	126070	120080	120082	120084	120078	120080
93	118078	118078	114078	146070	136072	134072	148068	144072	138072
94	152060	140074	138086	132080	130080	124078	128078	124078	122078
95	118084	118084	116080	158064	146074	140078	160078	150086	150082
96	164068	160080	148082	140084	136080	130080	130072	126076	124076
97	130084	130086	130086	148070	140088	136088	148074	140080	140084
98	152068	140078	132080	140080	130084	130086	130084	128086	126086
99	116090	116090	116088	144070	138076	138078	142070	138072	130072
100	150072	138078	132076	128076	122080	120078	116078	116080	116078
101	122088	122088	124090	170068	164072	155076	170078	154080	148080
102	170068	158084	138086	134080	134082	130084	128084	128084	126084
103	114080	112078	112080	130066	126068	128070	150060	138064	126068
104	158060	134064	132070	130072	128072	124076	126078	124076	120076
105	112080	114076	112076	146068	140074	128072	160068	158080	140076
106	160064	140080	138080	138078	128076	122078	122076	130072	126074
107	100078	110078	110080	138064	136070	130074	140050	138076	140076
108	160058	158076	154076	148076	144076	140076	132078	138078	138080
109	114084	112086	112086	134080	130084	124078	148076	142080	136080
110	144076	143080	132084	130082	130082	124080	122080	120082	118080
111	128088	126088	124088	144076	130084	132082	148072	138072	138076
112	152068	138084	128082	128084	126084	124084	124084	124086	124086
113	122090	116090	118086	140068	124070	122070	160062	132070	134070
114	158056	140068	136070	132074	130076	128072	126080	126084	124082
115	116070	112076	110074	138058	118068	110070	128058	120068	112070
116	138060	120068	112070	110068	108078	108072	104074	102074	102076
117	104070	104076	102078	126064	114060	112064	132060	126068	120064
118	142068	122070	122064	118068	116072	110072	106072	108070	106070
119	110076	112076	110078	130060	118064	118064	142060	120062	108068
120	140064	132064	118070	116070	114070	114068	116070	112068	110070

121	110084	112088	114084	152058	130060	122070	164040	154056	140068
122	174042	150060	132070	122068	126070	122070	118070	110070	116070
123	128080	128080	130080	176056	150060	142070	182030	170058	154064
124	188030	148050	144060	140064	140064	132066	130070	128070	126072
125	110080	108080	112080	168066	160072	144070	184068	162076	158076
126	210040	190060	158068	152068	152068	140068	142070	134070	132070
127	106072	104072	104072	135078	128074	124076	132070	124070	122072
128	160072	150078	128078	118074	108074	106072	104078	106078	106080
129	110068	108068	108066	138056	132050	130055	142060	136062	130064
130	150060	142062	138064	120066	120068	120068	120070	118072	116074
131	112086	112084	112080	162052	146074	128070	164056	162050	140068
132	164060	152068	144070	136070	128070	124072	120072	116074	114076
133	124078	126078	120078	150060	140072	134072	150070	150072	142072
134	164072	150076	148072	144078	126080	124080	124080	124082	122084
135	132090	132090	134088	180072	172060	164055	208025	180054	160058
136	194020	176060	159068	150066	144076	150078	148078	130080	138080
137	130084	130086	130084	170058	168070	164076	190035	178058	170064
138	196045	170058	170064	132068	140068	140072	140080	142080	142080
139	112084	110084	112086	132070	128076	126080	144068	140076	130072
140	142052	136070	134070	132070	126070	120070	118070	116068	110070
141	110076	112070	114070	150056	134062	130064	160030	148058	132060
142	160040	144056	116060	112064	112070	112070	114070	114070	112068
143	116074	116070	118076	168020	154050	138060	174060	155062	155064
144	178040	155045	140068	140068	134068	122068	120066	116064	116068

END OF FILE

3. Raw data for isokinetic exercise-heart rate
Read 060; 104; 102; 100; 065; etc.

1	060104102100065115112118063112112115
2	060145155160068153160165061153160169
3	056132138144053140140150053138147150
4	055130138128046135150149047120131143
5	056137145150055140150143054150155162
6	057110115125064137150148053130139127
7	083115123137066115118130080135140140
8	059113115128074150158150060135142150
9	069135143147073132140148070127140167
10	061118125135060128140145060135145152
11	059120142146052134150153044142153160
12	083135126140070116120125081144148153
13	063090113112080130135142065125133135
14	047108133142049142145157051140150157
15	060136152155061145146148056137143145
16	052140152153053143150152052150160160
17	081135135145064138146159069155160166
18	052162174183070193205207064183190193
19	042125142142053123136138044133143153
20	064100105112064125133138059115132127
21	043143155162049150166172051147163170
22	084165174195085175183187080177187193
23	050130146163049165175175052158175173
24	105163185190077180187193063186190195

END OF FILE

4. Raw data for isokinetic exercise-blood pressure
Read 130/88 (systolic/diastolic); 210/66; 200/72; etc.

```
 1   130882 106620072 18960 11479 18056 18050 17250 11177 15060 15064 17058
 2   11979 16454 19052 18050 12086 18058 17658 17250 12588 17072 19064 18564
 3   129822 10682 10702 1074 12089 180762 106822072 127912 105522064 22068
 4   12668 198 10198 1019008 13279 19025 18010 17805 12880 19030205 1020005
 5   11377 16048 16040 19040 12785 18062 17056 20060 11379 17045 17045 16050
 6   12699 17060 18058 18068 12284 19068 19048 19045 13085 18060 17545 19250
 7   11485 19060 19264 18958 12 180 17050 18040 21038 11990 18044 18240 17638
 8   11882 16064 16052 14860 11884 17068 16870 17062 11882 18062 16855 17060
 9   13593 15068 15576 16072 12797 17062 18072 17870 12796 17076 18482 19078
10   11265 19856 16450 16660 11076 15664 18456 18068 10675 15268 17066 17054
11   13185 18858 19272 19468 11774 18045 19228 19428 12986 16848 18832 19035
12   12183 19050 19045 19050 12388 16872 19272 19658 11484 16038 17940 17240
13   11984 16854 17045 16848 11772 15825 158 10170 15 12087 16038 16828 16030
14   10878 16470 17068 16864 10676 15048 17052 15848 1098 1 16855 16060 16060
15   11369 19220 189 10202 1011574 19220 194 10199 1012374 17620205 1021505
16   11678 20572 205552 10601 1778 17050 17264 17840 11783 17060 18040 19050
17   12986 18854 18042 19638 11689 19955 18830 17640 12388 19240 19646 19640
18   11381 16054 16438 15815 11377 15825 15020 15840 10778 14440 14830 15225
19   11585 14840 15230 15820 12789 14645 16030 17030 11788 15835 16025 15820
20   11473 14052 14235 15040 10374 14250 16448 16050 11176 14658 15852 15058
21   11284 17015 18205 19005 13083 18220 186 10192 101 108 1 19024 198 152 1015
22   10672 16240 15842 15832 10968 14030 14530 15820 11384 17010 178 10178 10
23   12579 16255 16830 16620 13290 19605 190 10 19005 13184 192 15 197 16 198 10
24   11484 14025 148 10 15220 11373 155 10 16805 168 10 1 1674 162 10 170 10 174 10
END OF FILE
```

5. Raw data for isometric rest-quadriceps-heart rate
Read 070; 087; 080; 078; 080; etc.

1	070087080078080
2	068072075077075
3	062063068057075
4	058050052052075
5	063060067070065
6	055055052055060
7	080088083065082
8	070068070062070
9	062063060059080
10	060067062062080
11	060065063067075
12	050050050053070
13	060060065080085
14	065073073068067
15	056063058075085
16	058050083054085
17	062074057070075
18	070055070070064
19	065056056062062
20	045055045040080
21	055062064060050
22	087085087087108
23	060061072065070
24	065058058068074
25	080080080075083
26	086083086078085
27	060065059050070
28	065057065060070
29	065060078073068
30	063060062048061
31	084082080073095
32	075065068063080
33	065067060068065
34	070075075065063
35	060060070067086
36	050053053052055
37	063068066066060
38	067068072075087
39	073074070058088
40	070067070058080
41	065077066070072
42	077060077055078
43	043060060055068
44	048046055047075
45	060050073055067
46	106105111100113
47	065065060065062
48	070062068063073
49	087083078074076
50	093082090080080
51	065062062064072
52	075062060050053
53	074080083075070
54	065055053054057
55	085087065090078
56	056061071060068
57	077065060064070
58	070069068058065
59	075080070062083
60	063055047060047
61	096060057070074
62	077080073072063
63	070070056065068
64	068053052058072
65	066067062065070
66	074068080085073
67	075060057050056
68	060067048060048
69	065058053052085
70	112092102103098
71	067060056057065
72	070065070067070
73	070080073078084
74	090092083087097
75	070077052050067
76	067062059070055
77	080075073074070
78	056057059063058
79	083095080077090
80	080060062065058
81	068068065068067
82	072082063065067
83	064065058063070
84	053050045060053
85	063063067060065
86	082077068073070
87	072075072065072
88	060050060055070
89	074068065068068
90	063098087075065
91	063055053065063
92	070077065055065
93	075052067050080
94	112110105100103
95	070070060060067
96	064060053056053
97	083082073073072
98	090083082085087
99	065060055059062
100	062053055055052
101	077076075074085
102	055054057060058
103	086079075080078
104	072065058075058
105	078077065072063
106	067061062066060
107	085075067070072
108	053053043052056
109	072072068074062
110	075074071073075
111	055055058070065
112	085055057068050
113	077073070068065
114	070083060080073
115	087083065053055
116	062052050057048
117	064060050050050
118	115120100120100
119	065065060072065
120	055050055055055

6. Raw data for isometric rest-quadriceps-blood pressure
Read 122/082 (systolic/diastolic); 122/084; 120/084; etc.

1	122082	122084	120084	118090	120090
2	120084	120082	122084	122088	120090
3	120088	122088	118088	118090	120090
4	132090	132084	128080	130096	130094
5	130090	124090	126090	126092	126100
6	110080	110078	118076	120084	118076
7	120084	120098	118086	120078	122092
8	140100	142100	140100	142100	146100
9	124092	122092	124090	124092	124092
10	104078	106078	108074	110076	104076
11	128080	128084	128080	128080	128086
12	112078	110076	110076	110078	112084
13	118084	118088	120086	118086	122088
14	112090	112090	112088	112088	112088
15	112078	114070	116076	114080	116070
16	110080	106076	110080	108080	114084
17	120090	130094	132094	134094	136098
18	112076	110080	118080	116078	116080
19	126092	128090	128090	128090	128090
20	110090	110088	112088	112088	112088
21	108070	106066	108068	108070	110070
22	112080	110076	108080	110078	110080
23	106068	104068	104068	104068	104070
24	128082	126082	126082	126080	126084
25	120084	120084	124084	122086	122088
26	130090	128088	120090	122090	122088
27	138084	136088	128088	132092	132090
28	140088	128086	138090	138088	140090
29	120088	120090	118090	122094	130100
30	142082	134072	132070	132068	132068
31	120084	120084	120090	120090	120092
32	155108	153100	144098	142098	144098
33	130096	128096	132090	130098	130096
34	126072	110072	110080	108078	108076
35	138080	124086	132078	132084	132086
36	120080	112080	112080	110080	110080
37	120084	118084	116084	116086	116086
38	120088	120086	120084	120086	120086
39	140078	136078	124074	130076	124078
40	115088	112084	112086	110084	110084
41	144094	136098	136098	140100	142100
42	128076	118076	118076	120076	116074
43	120088	120090	118090	116090	124090
44	128076	130078	128078	128086	124080
45	118070	116070	110070	112070	110070
46	120080	122084	108080	112086	110088
47	106068	100070	100070	100070	100068
48	130084	130088	138086	132084	132086
	130092	128086	130084	128088	126080
	140092	130092	130112	128090	130092
	132080	132080	130070	128084	118084
	150100	160110	154094	140090	140096
3	128096	120094	124090	130088	124092
54	140080	130064	128064	124066	130068
55	120088	130090	125084	120090	122090
56	144096	146094	146096	138098	140098
57	146096	134090	130088	132088	130088
58	120070	118076	112076	112070	110074
59	140084	134082	128082	134082	132086
60	122084	120080	120078	120080	118076
61	122078	112084	114078	114078	112076
62	124080	120080	122084	120086	122090
63	140064	138070	130074	130076	116072
64	122086	114072	112080	112082	114082
65	148090	148088	132094	130088	130092
66	130070	118072	110074	114078	114078
67	142080	130084	128088	130088	128088
68	144070	130070	126076	126078	130076
69	120066	120064	114064	110068	108064
70	128086	118078	118078	118080	120080
71	110060	104060	100064	104070	104070
72	136080	140086	134086	138086	136086
73	122088	122090	122088	122084	122086
74	130096	128096	110090	110092	110094
75	132080	132080	130070	128084	118084
76	140090	138088	140088	138088	142090
77	138090	128088	128090	120084	122090
78	150080	140084	144074	130070	132068
79	132082	122098	124092	118080	120082
80	158108	142100	144098	144100	144098
81	140092	134092	128090	128094	128088
82	120072	112080	112072	112072	114070
83	146080	146078	144078	140080	136080
84	120080	110076	110076	108076	110076
85	124084	122084	116084	116082	114080
86	126090	128086	119086	118086	118086
87	136080	130076	132084	134078	136076
88	122082	112078	110080	110082	110080
89	138090	136090	126090	126092	124094
90	128070	124072	122072	118074	122076
91	130088	128088	126090	126090	124090
92	132076	120080	134090	134090	140082
93	122056	118060	110060	110068	112070
94	110090	118086	130088	128086	126080
95	110070	108068	108070	104068	104070
96	138084	134080	134080	136080	136080
97	130090	124088	124088	118080	120084
98	122090	122090	124090	112090	118090
99	132086	126080	124080	120088	118090
100	156098	148090	138088	138088	138084
101	138098	130098	130090	120090	120092
102	130076	128074	126070	127070	122072
103	122084	120080	124082	124080	122082
104	152110	154110	144096	146096	140096
105	132098	138100	130100	130098	130094
106	112080	110072	104072	102076	102074
107	150080	142082	140086	138086	130080
108	124080	120082	122080	120078	118084
109	130080	128084	120080	118080	118084
110	128088	120080	120084	118084	120084
111	130088	130080	122074	120076	120076
112	120080	120084	118084	118086	118082
113	126098	126090	130092	130090	132092
114	130080	116074	116074	116076	114070
115	132078	130082	132080	132090	130090
116	124084	124086	122084	120086	122076
117	120064	110064	112066	110068	112070
118	124080	128076	128074	124076	128078
119	100068	104070	100068	100068	100070
120	138082	132084	134084	134082	130082

7. Raw data for isometric rest-hamstrings-heart rate
Read 077; 080; 070; 082; 077; etc.

1	077080070082077
2	085083087078078
3	093058067060064
4	057050057054080
5	067075074080090
6	065052055054080
7	080065080072107
8	057057073057080
9	065067062060065
10	053062058053073
11	052060055050070
12	052051058057065
13	065065063063074
14	067073067065082
15	060060077058078
16	052048050053067
17	062070063070080
18	053060055052087
19	060070055060070
20	045052057047065
21	043050053062045
22	083085097085100
23	070070065065075
24	063055060060065
25	090097078077080
26	086083086078085
27	060065059050070
28	065057065060070
29	065060078073068
30	063060062048061
31	084082080073095
32	075065068063080
33	065067060068065
34	070075075065063
35	060060070067086
36	050053053052055
37	063068066066060
38	067068072075087
39	073074070058088
40	070067070058080
41	065077066070072
42	077060077055078
43	043060060055068
44	048046055047075
45	060050073055067
46	095093083102105
47	066065064065068
48	058065055068070
49	087077072077080
50	093082090080080
51	055065058065072
52	062055062057055
53	080075075090062
54	055053050063065
55	073083078080074
56	061058062055058
57	065073063060073
58	060060055060072
59	055050055055087
60	065068055068068
61	067068068074068
62	074070075078075
63	065057059068078
64	050058051054055
65	070069070067070
66	068073068080064
67	058056053060053
68	065057050058063
69	060065058056048
70	097107080087095
71	065065060068065
72	057050058052075
73	082074080077082
74	083082083092088
75	087052056046085
76	058057060055055
77	078073080075075
78	055053053052059
79	093064078070077
80	067058058058070
81	067066073065065
82	066067057072068
83	053052053054058
84	062062053054057
85	077060065068068
86	067062062067068
87	084052070065080
88	047051052058060
89	070078075077068
90	063055060057060
91	053055055055048
92	083055055056057
93	063048060055070
94	089093090095093
95	065070072063070
96	053067053055053
97	077090077064080
98	080078085075076
99	068064074065064
100	057060057062053
101	082080080075082
102	050057053050050
103	088078078067073
104	065060062063055
105	073065068065063
106	070055060057057
107	066068065065065
108	060055059056065
109	070070070063078
110	072068070069068
111	072060078060080
112	050053052055055
113	065067065072068
114	060070073062065
115	070075075080070
116	053067042066055
117	053050075052055
118	115095103093100
119	067063067065065
120	055065053063055

8. Raw data for isometric rest-hamstrings-blood pressure

Read 120/084 (systolic/diastolic); 116/084; 118/084; etc.

1	120084	116084	118084	130086	124088
2	110084	118090	112090	116092	120096
3	130090	130092	128090	128090	130090
4	130092	128084	130090	130088	130092
5	130094	120096	118092	120090	120096
6	115068	115088	118070	118070	120068
7	118084	120080	120084	120084	128088
8	122096	120096	130100	130100	130104
9	130096	128096	128096	126094	126098
10	118076	116076	112076	110072	110074
11	136090	132090	130086	130088	132090
12	116078	110080	110080	110080	110082
13	118084	118084	118082	116080	114084
14	122084	120086	118088	120088	122088
15	122076	122076	124076	122080	124076
16	112084	112084	112084	110080	112086
17	122090	124092	126094	124096	124096
18	110076	110074	108070	110070	112074
19	120096	118092	124096	124096	126096
20	118080	120084	118086	118086	118086
21	104068	104070	104068	104066	104066
22	112078	112080	110078	112080	114078
23	106070	106068	104070	104070	104070
24	120080	120080	120080	124084	124084
25	128090	130088	126088	120088	118084
26	115090	130090	124092	120084	120096
27	120090	124090	120088	122090	120094
28	130088	120080	124088	126090	124090
29	124092	124088	130088	122090	120090
30	150090	132078	140070	140070	138070
31	115090	118084	118084	124080	120088
32	142096	138096	138096	138100	140096
33	132098	130098	130096	130098	132098
34	120074	112074	110074	110076	110076
35	140083	130080	130084	128084	128084
36	114080	110078	108078	108078	108080
37	110082	110080	112080	110080	108080
38	112080	112080	112084	110084	110084
39	140070	138064	136070	126078	126068
40	110076	112080	114084	114080	110084
41	134090	132092	130094	132094	134096
42	140082	118080	118080	114080	110078
43	128090	126090	130090	128088	130090
44	142070	128076	120080	120088	118080
45	104066	106072	106070	108066	104068
46	112078	108078	110080	108080	110080
47	104064	104064	104068	106068	106068
48	130080	130088	130082	132088	128084
49	132100	126098	120084	122092	120088
50	118084	124090	120092	112088	110096
51	130090	120080	138094	128090	128090
52	138088	140088	136090	128090	132086
53	132098	120094	120088	118090	120090
54	138088	120072	124068	120070	116076
55	120096	120094	118086	120080	122084
56	140096	138090	142096	138096	138092
57	132098	138090	134100	136094	136094
58	110070	110076	110080	110078	110070
59	138076	136084	130080	132076	132076
60	118078	116082	112080	110080	110080
61	120078	114084	114080	112080	110080
62	124082	122088	120084	118086	122088
63	140072	136072	136072	124070	132070
64	124086	124080	120078	118080	120078
65	140096	132096	130100	130100	132100
66	140074	120076	116076	118074	118080
67	148090	140086	136088	132088	132086
68	124076	122088	120084	118084	118086
69	120058	110066	110068	110060	112066
70	118074	122076	118076	118070	112068
71	108070	104070	104068	104070	104068
72	140086	146082	132080	134078	136082
73	126108	120090	120088	122096	120092
74	110090	110088	112092	108090	112090
75	130088	120090	126088	120088	120090
76	130094	130090	128088	130088	128090
77	130090	120092	120090	118088	122088
78	128076	110078	118080	120076	112084
79	118088	118080	118090	118086	120078
80	148104	138100	138098	140092	140100
81	132100	130096	130096	128098	130098
82	112084	110076	112080	110080	110080
83	140084	140080	140078	132078	134080
84	148080	120082	118084	118080	118084
85	124086	120086	118084	114084	112084
86	118088	118092	118090	118088	118090
87	136078	120078	120078	126076	120072
88	112076	110076	112080	112080	112080
89	132100	124100	122100	126100	130100
90	118080	118080	120076	114078	118078
91	130090	130088	130088	130090	130090
92	118070	118076	118078	112080	112080
93	122056	120070	115068	115070	110068
94	112076	112074	110074	110076	110076
95	110068	112064	112068	104076	108074
96	140080	138080	132080	136082	132086
97	120094	116090	120090	118088	116096
98	116084	112080	104088	116084	112084
99	130090	128088	120090	120084	120088
100	138090	128092	126086	130090	130092
101	118090	110088	118082	116088	110082
102	118080	110076	120076	116076	118080
103	128080	128080	128084	124080	124080
104	144098	140100	140098	140110	140094
105	128098	132096	132098	130096	130098
106	108084	108078	108076	102070	108070
107	140084	142084	140082	130080	130080
108	112070	110078	108082	108080	108080
109	118086	116086	116084	116082	114082
110	124084	120090	120090	118092	118088
111	124080	112080	112076	116078	112076
112	122080	120080	120082	116080	112078
113	138092	138100	136098	132094	132090
114	114074	116074	118076	114076	114076
115	138080	138090	130092	128092	132092
116	120084	116080	118082	118080	114082
117	122068	108072	102068	104066	104068
118	138074	128076	120074	114072	108076
119	100070	104076	104072	102068	104070
120	134070	132088	132080	130078	130082

9. Raw data for isometric exercise-quadriceps-heart rate

Read 110; 087; 078; 090; etc.

```
   1     110087078090
   2     132130110090
   3     080075075066
   4     107120062058
   5     113123095070
   6     140096072060
   7     150133092090
   8     101117080060
   9     112112087072
  10     095093079060
  11     132122085065
  12     108100087058
  13     115122098073
  14     113087072066
  15     133138093074
  16     117118082075
  17     090104076065
  18     160145102085
  19     125105065056
  20     115125080047
  21     133128095052
  22     174181110106
  23     090095085063
  24     140100080060
END OF FILE
```

10. Raw data for isometric exercise-quadriceps-blood pressure

Read 140/110 (systolic/diastolic); 130/100; 120/88; etc.

1	140110130100120088136100
2	134110140100152110128100
3	168110150110158124148096
4	180138190120160110142096
5	160110160120142110130096
6	184110182108148088140080
7	150110155128142100144090
8	170130170115158120146098
9	162120150115150100136108
10	150118160106122100116074
11	190130192124160110140084
12	150098148110128088120084
13	150094142100144092128086
14	152104142104136090122090
15	160110166116140096134084
16	160124148114130090120090
17	154120160120140104130096
18	160120160122136104124090
19	172124115108148090130094
20	210140178110140110130084
21	150116150118124090118072
22	152090143092134102130092
23	132100132090120078108076
24	172130164115136090136086

END OF FILE

11. Raw data for isometric exercise-hamstrings-heart rate

Read 100; 096; 085; 085; etc.

1	100096085085
2	124095085087
3	082063070073
4	108105058055
5	135098080076
6	135076065062
7	150147088078
8	115089070063
9	105105073065
10	098087067060
11	108122078058
12	124092075072
13	093093080070
14	087087077076
15	150138086081
16	124125065055
17	080078066073
18	130110067060
19	125085050043
20	103100063063
21	117118078055
22	155145100094
23	094082066062
24	116103082063

END OF FILE

12. Raw data for isometric exercise-hamstrings-blood pressure

Read (140/110 (systolic/diastolic); 142/110; etc.

```
 1    140110142110138098132096
 2    148120120096128084112088
 3    162112170120140096126090
 4    170138160130144092130090
 5    150120122100128096120090
 6    180110155096140084125080
 7    140115155110144100128092
 8    180118150110150098142096
 9    155112160112136102132096
10    142092140110122084110084
11    168110160118150090136084
12    148114132090126072120078
13    168120128092128084120088
14    148102126106122088118086
15    190138168130138088122082
16    156130150110128090118084
17    160128140100142098136098
18    170092142098124080118072
19    170122142100140088130090
20    152120155130138094118084
21    178110152108130080110068
22    150100136096118080112078
23    142110124084112070108074
24    170130152110150096140088
END OF FILE
```

13. Raw data for isokinetic rest
   (a) mean blood pressure (V28-V36)
   (b) modified tension time index (V37-V45)
   (c) pulse pressure (V46-V54)

```
1   130  88.130. 86.130. 90.140. 78.132. 84.130. 88.138. 78.134. 80.126 86. 62 58. 60 75 63. 65. 73 65. 70. 101.90
    100.57 103.23 98.57 99.90 101.90 97.90 97.90 99.23 80.60 75.40 78.00 105.00 83.16 84.50 100.74 87.10 88
    20 42.00 44.00 40.00 62.00 48.00 42.00 60.00 54.00 40.00
2   140. 70.142. 82.130. 86.136. 84.128. 88.128. 86.126. 86.130. 86.130. 86. 70. 60. 67. 65. 68. 61. 59 62. 62. 93.24
    101.90 100.57 101.23 101.23 99.90 99.23 100.57 100.57 98.00 85.20 87.10 88.40 87.04 78.08 74.34 80.60 80
    60 70.00 60.00 44.00 52.00 40.00 42.00 40.00 44.00 44.00
3   115. 78.112. 80.114. 80.130. 74.130. 78.128. 70.140. 70.124. 76.122. 76. 62. 65. 67 85. 75. 75 83. 68. 75. 90.24
    90.58 91.24 92.57 95.24 89.24 93.24 91.91 91.24 71.30 72.80 76.38 110.50 97.50 96.00 116.20 84.32 91.
    50 37.00 32.00 34.00 56.00 52.00 58.00 70.00 48.00 46.00.
4   136. 76.130. 74.122 76.120. 78.122. 76.122. 76.120. 80.120. 80.118. 80. 83. 75. 70 70 78. 73. 65 60. 72. 95.90
    92.57 91.24 91.91 91.24 91.24 93.24 93.24 92.57 112.88 97.50 85.40 84.00 95.16 89.06 78.00 72.00 84.
    96 60.00 56.00 46.00 42.00 46.00 46.00 40.00 40.00 38.00
5   110. 78.112. 76.112. 78.132. 68.118. 76.115. 76.132. 76.128. 76.138. 76. 60. 63. 65. 75. 65. 70. 78 73. 72. 88.58
    87.91 89.24 89.24 89.91 88.91 94.57 93.24 96.57 66.00 70.56 72.80 99.00 76.70 80.50 102.96 93.44 99.
    36 32.00 36.00 34.00 64.00 42.00 39.00 56.00 52.00 62.00
6   144. 68.136. 78.128. 74.128. 76.124. 80.124. 76.124. 76.120. 76.118. 70. 80. 74. 68 74. 72. 74. 70. 70. 76. 93.24
    97.24 91.91 93.24 94.57 91.91 91.91 90.58 85.91 115.20 100.64 87.04 94.72 89.28 91.76 88.80 84.00 89.
    68 76.00 58.00 54.00 52.00 44.00 48.00 48.00 44.00 48.00
7   120. 78.118. 80.118. 80.152. 68.140. 70.132. 74.158. 70.140. 76.138. 78. 65. 73. 67. 75. 62.110.102. 93 100. 91.91
    92.57 92.57 95.90 93.24 93.24 99.23 97.24 87.90 78.00 86.14 79.06 114.00 86.80 145.20 161.16 130.20 138.
    00 42.00 38.00 38.00 84.00 70.00 58.00 88.00 64.00 60.00
8   164 70.142. 76.132. 76.132. 80.132. 78.128. 78.122. 76.118. 74.122. 70. 96. 75. 90. 80 90. 85 80. 90. 90. 101.23
    97.90 94.57 97.24 95.90 94.57 91.24 88.58 87.25 157.44 106.50 118.80 105.60 118.80 108.80 97.60 106.20 109.
    80 94.00 66.00 56.00 52.00 54.00 50.00 46.00 44.00 52.00
9   120. 86.120. 86.120. 86.164. 76.150. 78.136. 80.172. 74.150. 80.148. 78. 58. 60. 60. 60. 60. 95. 60. 63. 95. 97.24
    97.24 97.24 105.23 101.90 98.57 106.56 103.23 101.23 69.60 72.00 72.00 98.40 90.00 129.20 103.20 94.50 140
    60 34.00 34.00 34.00 88.00 72.00 56.00 98.00 70.00 70.00
10  180. 68.168. 72.140. 80.136. 78.130. 76.132. 76.128. 72.120. 80.122 80. 90. 83. 68 85. 70. 80. 80. 73. 80. 105.23
    103.90 99.90 97.24 93.91 94.57 90.58 93.24 93.91 162.00 139.44 95.20 115.60 91.00 105.60 102.40 87.60 97.
    60 112.00 96.00 60.00 58.00 54.00 56.00 56.00 40.00 42.00
11  126. 88.126. 88.120. 88.152. 80.142. 86.140. 80.178. 76.164. 86.150. 88. 64. 60 60 83. 75. 95.115. 87.115. 100.57
    100.57 98.57 103.90 104.56 99.90 109.89 111.89 108.56 80.64 75.60 72.00 126.16 106.50 133.00 204.70 142.68 172.
    50 38.00 38.00 32.00 72.00 56.00 60.00 102.00 78.00 62.00
12  184. 72.156. 86.152. 88.140. 88.130. 84.130. 80.130. 82.128. 80.120. 80. 95. 97. 92 90. 85 90. 76. 87. 95. 109.22
    109.22 109.22 105.23 99.23 96.57 97.90 95.90 93.24 174.80 151.32 139.84 126.00 110.50 117.00 98.80 111.36 114.
    00 112.00 70.00 64.00 52.00 46.00 50.00 48.00 48.00 40.00
13  130. 82.128. 84.130. 80.160. 90.140. 88.142. 88.178. 92.158 88.158 88. 57. 55. 55 70 65. 80. 74. 65 73. 97.90
    98.57 96.57 113.22 105.23 105.89 120.55 111.22 111.22 74.10 70.40 71.50 112.00 91.00 113.60 131.72 102.70 115.
    34 48.00 44.00 50.00 70.00 52.00 54.00 86.00 70.00 70.00
14  190. 76.160. 82.148. 84.142. 88.142. 84.132. 82.138. 88.130. 88.130. 88. 70. 60. 65. 57 62. 61. 70. 58. 60. 113.89
    107.89 105.23 105.89 103.23 98.57 104.56 101.90 101.90 133.00 96.00 96.20 80.94 88.04 80.52 96.60 75.40 78.
    00 114.00 78.00 64.00 54.00 58.00 50.00 50.00 42.00 42.00
15  120. 88.118. 88.120. 90.172. 80.160. 80.142. 82.182. 84.166. 88.154. 88. 54. 48. 58. 70. 65. 63. 75. 72. 72. 98.57
    97.90 99.90 110.56 106.56 101.90 116.55 113.89 109.89 64.80 56.64 69.60 120.40 104.00 89.46 136.50 119.52 110
    88 32.00 30.00 30.00 92.00 80.00 60.00 98.00 78.00 66.00
16  182. 88.160. 86.148. 88.146. 88.138. 88.138. 90.136. 88.134. 88.130. 90. 72. 70. 73. 60. 62. 65. 60. 59. 62. 119.21
    110.56 107.89 107.23 104.56 105.89 103.90 103.23 103.23 131.04 112.00 108.04 87.60 85.56 89.70 81.60 79.06 80.
    60 94.00 74.00 60.00 58.00 50.00 48.00 48.00 46.00 40.00
17  124. 90.126. 92.128. 90.170. 80.156. 90.150. 90.190. 88.170. 92.170. 90. 52. 55. 52 75. 62 70. 70. 70. 85. 101.23
    103.23 102.56 109.89 111.89 109.89 121.88 117.88 116.55 64.48 69.30 66.56 127.50 96.72 105.00 133.00 119.00 144.
    50 34.00 34.00 38.00 90.00 66.00 60.00 102.00 78.00 80.00
18  190. 92.170. 90.152. 90.142. 88.142. 84.142. 88.138. 86.132. 88.132. 82. 97. 68. 62 70. 70 68. 60. 65. 62. 124.54
    116.55 110.56 105.89 103.23 105.89 103.23 102.56 98.57 184.30 115.60 94.24 99.40 99.40 96.56 82.80 85.80 81.
    84 98.00 80.00 62.00 54.00 58.00 54.00 52.00 44.00 50.00
19  125. 68.124. 68.124. 68.168. 40.146. 60.148. 68.162. 40.158. 60.150. 60. 50 55. 55 70. 58. 83. 65. 67. 82. 86.91
    86.58 86.58 82.58 88.58 94.57 80.59 92.57 89.91 62.50 68.20 68.20 117.60 84.68 122.84 105.30 105.86 123.
    00 57.00 56.00 56.00 128.00 86.00 80.00 122.00 98.00 90.00
20  160. 52.148. 60.140. 60.136. 60.136. 62.128 62.128. 68.128. 62.128 66. 73. 56. 60. 65. 54. 53. 61. 62. 58. 87.91
    89.24 86.58 85.25 86.58 83.92 87.91 83.92 86.58 116.80 82.88 84.00 88.40 73.44 67.84 78.08 79.36 74
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   24 108.00  88.00  80.00  76.00  74.00  66.00  60.00  66.00  62.00
21 130. 76.132. 82.132. 80.170. 20.170. 20.170. 25.178. 10.178. 15.174. 15. 44. 35. 55. 80  80. 95.105 .90 110.  93 91
    98.57  97.24  69.93  69.93  73.26  65.93  69.26  67.93  57.20  46 20  72.60 136.00 136.00 161.50 186.90 160.20 191
   40  54.00  50.00  52.00 150.00 150.00 145.00 168.00 163.00 159.00
22 178. 10.166. 15.160. 30.156  50.152. 56.150. 56.142. 58.140. 64.140. 66.100. 87. 78  76. 75. 75. 74. 76. 73.  65.93
    65.27  73.26  85.25  87.91  87.25  85.91  89.24  90.58 178.00 144.42 124.80 118.56 114.00 112.50 105.08 106.40 102.
   20 168.00 151.00 130.00 106.00  96.00  94.00  84.00  76.00  74.00
23 128. 80.130. 80.130. 78.156. 50.144. 54.120. 66.160. 42.158  40.148. 42. 57. 43. 44. 62. 61. 54. 73. 68. 78.  95 90
    96.57  05.24  85.25  83.92  83.92  81.25  79.25  77.26  72.96  55.90  57.20  96.72  87.84  64.80 116.80 107.44 115.
   44  48.00  50.00  52.00 106.00  90.00  54.00 118.00 118.00 106.00
24 170. 10.152. 44.148. 50.144. 50.138. 60.140. 66.136. 70.132. 70.130. 72. 87. 73. 70. 72. 65. 62. 63. 70. 68.  63.27
    79.92  82.58  81.25  85.91  90.58  91.91  90.58  91.24 147.90 110.96 103.60 103.68  89.70  86.80  85.68  92.40  88.
   40 160.00 108.00  98.00  94.00  78.00  74.00  66.00  62.00  58.00
25 112. 80.116. 78.114. 76.120. 76.120. 72.124. 80.136. 64.120. 70.120. 70. 54. 58. 58. 73. 70. 60. 98. 60. 75.  90 58
    90.58  88.58  90.58  87.91  94.57  87.91  86.58  86.58  60.48  67.28  66.12  87.60  84.00  74.40 133.28  72.00  90
   00  32.00  38.00  38.00  44.00  48.00  44.00  72.00  50.00  50.00
26 158. 72.130. 72.122. 76.120. 76.120. 78.118. 78.112. 78.114. 76.112. 78. 76. 72. 73. 63. 68. 65. 65. 63. 66. 100.57
    91.24  91.24  90.58  91.91  91.24  89.24  88.58  89.24 120.08  93.60  89.06  75.60  81.60  76.70  72.80  71.82  73.
   92  86.00  58.00  46.00  44.00  42.00  40.00  34.00  38.00  34.00
27 128. 82.126. 84.126. 84.138. 78.140. 84.136. 86.146. 80.138. 84.138. 80. 53. 57. 53. 83. 72. 87. 78. 69. 78.  97.24
    97.90  97.90  97.90 102.56 102.56 101.90 101.90  99.23  67.84  71.82  66.78 114.54 100.80 118.32 113.88  95.22 107.
   64  46.00  42.00  42.00  60.00  56.00  50.00  66.00  54.00  58.00
28 148. 72.150. 72.132. 82.132. 84.134. 80.130. 82.130. 84.130. 84.128. 82. 86. 75. 97. 75. 78. 68. 70. 65. 75.  97.24
    97.90  98.57  99.90  97.90  97.90  99.23  99.23  97.24 127.28 112.50 128.04  99.00 104.52  88.40  91.00  84.50  96.
   00  76.00  78.00  50.00  48.00  54.00  48.00  46.00  46.00  46.00
29 114. 76.116. 78.112. 78.148. 68.128. 70.132. 78.148. 68.140. 72.126. 84. 55. 62. 50. 83. 68. 75. 85. 75. 88.  88.58
    90.58  89.24  94.57  89.24  95.90  94.57  94.57  97.90  62.70  71.92  56.00 122.84  87.04  99.00 125 80 105.00 110.
   88  38.00  38.00  34.00  80.00  58.00  54.00  80.00  68.00  42.00
30 148. 76.140. 70.140. 70.140. 72.138. 70.130. 70.128. 70.120. 70.120. 72. 92. 94. 90. 83. 75. 65. 72. 63. 70.  99.90
    93.24  93.24  94.57  92.57  89.91  89.24  86.58  87.91 136.16 131.60 126.00 116.20 103.50  84.50  92.16  75.60  84.
   00  72.00  70.00  70.00  68.00  68.00  60.00  58.00  50.00  48.00
31 124.100.126. 96.128.100.164. 90.158. 84.136. 84.170. 84.150. 90.140. 92. 56. 55. 55. 65. 55. 65. 70. 63. 65. 107.89
   105.89 109.22 114.55 108.56 101.23 112.55 109.89 107.89  69.44  69.30  70.40 106.60  86.90  88.40 119.00  94.50  91.
   00  24.00  30.00  28.00  74.00  74.00  52.00  86.00  60.00  48.00
32 170. 88.150. 94.150. 94.146.100.138. 96.140.100.142. 98.142.102.138.100. 72. 65. 70. 70. 70. 67. 72. 73. 65. 115.22
   112.55 112.55 115.22 109.89 113.22 112.55 115.22 112.55 122.40  97.50 105.00 102.20  96.60  93.80 102.24 103.66  89.
   70  82.00  56.00  56.00  46.00  42.00  40.00  44.00  40.00  38.00
33 122. 80.124. 88.122. 80.166  76.150. 92.140. 80.160. 92.150. 90.152. 90. 63. 58. 70. 75. 75. 75. 85. 77. 90.  93.91
    99.90  93.91 105.89 111.22  99.90 114.55 109.89 110.56  76.86  71.92  85.40 124.50 112.50 105.00 152.00 115.50 136.
   80  42.00  36.00  42.00  90.00  58.00  60.00  68.00  60.00  62.00
34 180. 90.160. 80.158. 84.152  86.150. 86.148. 84.148. 84.138. 84.140. 88. 93. 80. 80. 83. 80. 80. 78. 80. 78. 119.88
   106.56 108.56 107.89 107.23 105.23 105.23 101.90 105.23 167.40 128.00 126.40 126.16 120.00 118.40 115.44 110.40 109.
   20  90.00  80.00  74.00  66.00  64.00  64.00  64.00  54.00  52.00
35 130. 84.130. 86.130. 86.162. 82.160. 80.160. 80.177. 86.170. 80.162. 84. 55. 60. 50. 82. 72. 80. 90. 95.100.  99.23
   100.57 100.57 108.56 106.56 106.56 116.22 109.89 109.89  71.50  78.00  65.00 132.84 115.20 128.00 159.30 161.50 162.
   00  46.00  44.00  44.00  80.00  80.00  80.00  91.00  90.00  78.00
36 184. 80.170. 84.152. 88.150. 82.150. 86.150. 80.146. 86.144. 86.144. 84.103. 93. 85. 84. 85. 83. 85. 85. 82. 114.55
   112.55 109.22 104.56 107.23 103.23 105.89 105.23 103.90 189.52 158.10 129.20 126.00 127.50 124.50 124.10 122.40 118.
   08 104.00  86.00  64.00  68.00  64.00  70.00  60.00  58.00  60.00
37 116. 84.112. 88.112. 84.140. 72.138. 80.142. 80.142. 88.132. 80.132. 84. 85. 90. 73. 88. 70. 70. 75. 75.110.  94.57
    95.90  93.24  94.57  99.23 100.57 105.89  97.24  99.90  98.60 100.80  81.76 123.20  96.60  99.40 106.50  99.00 145.
   20  32.00  24.00  28.00  68.00  58.00  62.00  54.00  52.00  48.00
38 146. 82.142. 86.138. 90.130. 88.132. 88.128. 90.128. 90.124. 88.124. 88. 77. 90. 80. 77. 75. 78. 80. 73. 74. 103.23
   104.56 105.89 101.90 102.56 102.56 102.56  99.90  99.90 112.42 127.80 110.40 100.10  99.00  99.84 102.40  90.52  91.
   76  64.00  56.00  48.00  42.00  44.00  38.00  38.00  36.00  36.00
39 122. 80.122. 80.120. 80.144. 64.140. 68.140. 80.158. 60.148. 80.144. 80. 55. 55. 80. 80. 65.107. 70. 87.112.  93.91
    93.91  93.24  90.58  91.91  99.90  92.57 102.56 101.23  67.10  67.10  96.00 115.20  91.00 149.80 110.60 128.76 161.
   28  42.00  42.00  40.00  80.00  72.00  60.00  98.00  68.00  64.00
40 168. 60.140. 70.136. 70.136. 80.136. 78.132. 80.128. 80.126. 80.124. 80. 75. 68. 70. 75. 78. 82. 68. 85. 85.  95.90
    93.24  91.91  98.57  97.24  97.24  95.90  95.24  94.57 126.00  95.20  95.20 102.00 106.08 108.24  87.04 107.10 105.
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41  40 108.00  70.00  66.00  56.00  58.00  52.00  48.00  46.00  44.00
    118  90.120  88.118  90.155  76.136  78.132  82.152  80.132  82.132  88  83  70  74  60  85  85  95  98.118  99.23
     98.57  99.23 102.23  97.24  98.57 103.90  98.57 102.56  97.94  84.00  87.32  93.00 115.60 112.20 144.40 129.36 155
    76  28.00  32.00  28.00  79.00  58.00  50.00  72.00  50.00  44.00
42  148  74.138  88.130  76.124  80.122  82.118  84.118  80.116  84.112  86  90  90  84  85  86  87  86  84  85  98.57
    104.56  93.91  94.57  95.24  95.24  92.57  94.57  94.57 133.20 124.20 109.20 105.40 104.92 102.66 101.48  97.44  95
    20  74.00  50.00  54.00  44.00  40.00  34.00  38.00  32.00  26.00
43  118  88.118  84.118  78.120  68.116  72.118  72.142  78.126  78.122  80  47  65  63  68  70  [illegible]  77  60  57  97  90
     95.24  91.24  85.25  86.58  87.25  99.23  93.91  93.91  55.46  76.70  74.34  81.60  [illegible] 109.34  75.60  69
    54  30.00  34.00  40.00  52.00  44.00  46.00  64.00  48.00  42.00
44  130  80.136  80.124  82.124  80.124  80.126  80.124  80.122  82.122  84  75  70  [illegible]  75  68  58  96.57
     98.57  95.90  94.57  94.57  95.24  94.57  95.24  96.57  97.50  95.20  [illegible]  81.90  93.00  82.96  70
    76  50.00  56.00  42.00  44.00  44.00  46.00  44.00  40.00  [illegible]
45  116  84.118  84.120  88.154  876.150  78.136  80.166  [illegible]  73  75  90  93 102.112  [illegible]  94.57
     95.24  98.57 701.30 101.90  98.57 105.89 100.[illegible]  139.50 138.72 [illegible]
    00  32.00  34.00  32.00  [illegible]  72.00  56.00  [illegible]  50.00
46  146  76.130  80.130  86  [illegible]  124  84.124  80.124  80.124  76.124  84.108  100  [illegible]
     96.57 100.57  99.90  97  [illegible]  94.57  91.91  97.24 157.68 130.00 119.60 111.36  [illegible]
    40  70.00  50.00  44.00  [illegible]  40.00  44.00  44.00  48.00  40.00
47  118  84.118  78.118  82.144  [illegible]  138  80.140  82.150  72.132  86.138  80  55  63  63  85  [illegible]
     91.24  93.91 101.23  99.23  [illegible]  23  97.90 101.23  99.23  64.90  74.34  74.34 122.40  99.36  [illegible]
    00  34.00  40.00  36.00  64.00  58.00  58.00  78.00  46.00  58.00
48  142  72.128  78.126  80.120  78.120  70.116  78.112  78.112  76.112  72.100  80  85  80  78  70  [illegible]  95.24
     94.57  95.24  91.91  86.58  90.58  89.24  87.91  85.25 142.00 102.40 107.10  96.00  93.60  81.20  [illegible]  84.00  89
    60  70.00  50.00  46.00  42.00  50.00  38.00  34.00  36.00  40.00
49  138  92.132  92.132  94.144  76.140  88.132  88.140  80.120  80.120  88  70  70  70  80  70  87  87  76  88  107.23
    105.23 106.56  98.57 105.23 102.56  99.90  93.24  98.57  96.60  92.40  92.40 115.20  98.00 114.84 121.80  91.20 105
    60  46.00  40.00  38.00  68.00  52.00  44.00  60.00  40.00  32.00
50  142  84.132  88.122  84.128  84.124  84.124  84.120  84.118  84.116  88  90  78  70  80  75  75  85  85  85  103.23
    102.56  96.57  98.57  97.24  97.24  95.90  95.24  97.24 127.80 102.96  85.40 102.40  93.00  93.00 102.00 100.30  98
    60  58.00  44.00  38.00  44.00  40.00  40.00  36.00  34.00  28.00
51  130 100.130 100.124  92.135  72.120  80.126  80.122  88.128  84.124  80  67  80  70  90  75  75  75  75  85  109.89
    109.89 102.56  92.91  93.24  95.24  99.23  98.57  94.57  87.10 104.00  86.80 121.50  90.00  94.50  91.50  96.00 105
    40  30.00  30.00  32.00  63.00  40.00  46.00  34.00  44.00  44.00
52  140  80.136  80.124  84.124  80.120  78.120  82.120  86.120  86.120  88  83  75  90  75  75  85  85  78  86  99.90
     98.57  97.24  94.57  94.91  94.57  97.24  97.24  98.57 116.20 102.00 111.60  93.00  90.00 102.00 102.00  93.60 103
    20  60.00  56.00  40.00  44.00  42.00  38.00  34.00  34.00  32.00
53  128  96.124  90.128  96.138  80.132  80.132  82.156  88.136  84.136  88  70  73  70  80  75  78  88  80  85  106.56
    101.23 106.56  99.23  97.24  98.57 110.56 101.23 103.90  89.60  90.52  89.60 110.40  99.00 102.96 137.28 108.80 115
    60  32.00  34.00  32.00  58.00  52.00  50.00  68.00  52.00  48.00
54  150  80.130  82.130  80.130  82.128  80.126  84.122  84.120  84.120  86  78  80  85  85  95  85  90  80  81  103.23
     97.90  96.57  97.90  95.90  97.90  96.57  95.90  97.24 117.00 104.00 110.50 110.50 121.60 107.10 109.80  96.00  97
    20  70.00  48.00  50.00  48.00  48.00  42.00  38.00  36.00  34.00
55  110  64.112  66.112  64.120  68.116  68.120  70.128  72.122  78.118  80  71  57  62  75  60  65  93  64  90  79.25
     81.25  79.92  85.25  89.92  86.58  90.58  92.57  92.57  78.10  63.84  69.44  90.00  69.60  78.00 119.04  78.08 106
    20  46.00  46.00  48.00  52.00  48.00  50.00  56.00  44.00  38.00
56  138  64.126  70.118  72.118  72.116  72.110  70.116  70.120  70.122  74.100  75  75  80  75  70  70  65  65  88.58
     88.58  87.25  87.25  86.58  83.25  85.25  86.58  89.91 138.00  94.50  88.50  84.40  87.00  77.00  81.20  78.00  79
    30  74.00  56.00  46.00  46.00  44.00  40.00  46.00  50.00  48.00
57  110  76.110  76.110  76.140  64.128  68.126  72.156  76.140  78.138  78  62  57  60  85  83  88.101  95  95  87.25
     87.25  87.25  89.24  87.91  89.91 102.56  98.57  97.90  68.20  62.70  66.00 119.00 106.24 110.88 157.56 133.00 131
    10  34.00  34.00  34.00  76.00  60.00  54.00  80.00  62.00  60.00
58  162  72.140  78.136  76.128  74.126  70.118  70.118  70.112  72.112  72  96  94  86  77  74  73  78  75  77  5.99
     98.57  95.90  91.91  88.58  85.91  85.91  85.25  85.25 155.52 131.60 116.96  98.56  93.24  86.14  92.04  84.00  86
    24 234.00  62.00  60.00  54.00  56.00  48.00  48.00  40.00  40.00
59  106  74.106  76.104  76.140  70.128  72.128  70.150  68.138  64.130  66  66  66  53  87  78  80  93  87  90  84.58
     85.91  85.25  93.24  90.58  89.24  95.24  88.58  87.25  69.96  69.96  55.12 121.80  99.84 102.40 139.50 120.06 117
    00  32.00  30.00  28.00  70.00  56.00  58.00  82.00  74.00  64.00
60  144  70.138  70.130  72.120  72.118  68.110  66.106  70.106  70.106  68  96  85  78  76  80  75  80  76  73  94.57
     92.57  91.24  87.91  84.58  80.59  81.92  81.92  80.59 138.24 117.30 101.40  91.20  94.40  82.50  84.80  80.56  77
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     38  74.00  68.00  58.00  48.00  50.00  44.00  36.00  36.00  38.00
61   130. 84.130. 86.132. 86.160. 74.152. 76.156. 78.178. 78.158. 76.154. 72. 58. 66. 56. 67. 65. 90. 72. 80. 75.  99.23
     100.57 101.23 102.56 101.23 [illegible] 111.22 103.23  99.23  75.40  85.80  73.92 107.20  98.80 140.40 128.16 126.40 115
     50. 46.00  44.00  46.00  86.00 [illegible]  78.00 100.00  82.00  82.00
62   178. 76.162. 80.144. 82.142. 80.142. 74.140. 74.138. 68.134. 70.134. 70. 90. 85. 75. 78. 80. 80. 82. 83. 84. 109.89
     107.23 102.56 100.57  96.57  95.90  91.24  91.24  91.24 160.20 137.70 108.00 110.76 113.60 112.00 113.16 111.22 112.
     56 102.00  82.00  62.00  62.00  68.00  66.00  70.00  64.00  64.00
63   116. 74.116. 74.118. 76.150. 62.150. 70.138. 66.174. 60.160. 64.154. 70. 45. 47. 60. 78. 65. 90. 75. 75. 95.  87.91
      87.91  89.91  91.24  96.57  89.91  97.90  95.90  97.90  52.20  54.52  70.80 117.00  97.50 124.20 130.50 120.00 146.
     30  42.00  42.00  42.00  88.00  80.00  72.00 114.00  96.00  84.00
64   182. 70.160. 72.150. 72.146. 70.134. 66.132. 68.134. 74.132. 74.130. 70. 85. 85. 83. 87. 83. 78. 83. 83. 80. 107.23
     101.23  87.90  95.24  88.58  89.24  93.91  93.24  89.91 154.70 136.00 124.50 127.02 111.22 102.96 111.22 109.56 104.
     00 112.00  88.00  78.00  76.00  68.00  64.00  60.00  58.00  60.00
65   130. 84.128. 86.128. 86.166. 72.152. 76.150. 86.180. 52.166. 80.156. 80. 42. 44. 45. 68. 82. 90. 89. 80. 88.  99.23
      99.90  99.90 103.23 101.23 107.23  94.57 108.56 105.23  54.60  56.32  57.60 112.88 124.64 135.00 160.20 132.80 137.
     28  46.00  42.00  42.00  94.00  76.00  64.00 128.00  86.00  76.00
66   174. 72.150. 80.146. 76.142. 76.134. 72.130. 70.124. 70.122. 70.124. 70.100. 90. 90. 80. 78. 83. 80. 80. 80. 105.89
     103.23  99.23  97.90  92.57  89.91  87.91  87.25  87.91 174.00 135.00 131.40 113.60 104.52 107.90  99.20  97.60  99.
     20 102.00  70.00  70.00  66.00  62.00  60.00  54.00  52.00  54.00
67   118. 82.122. 84.120. 80.156. 80.132. 88.130. 88.144. 80.134. 82.134. 80. 86. 82. 86. 98. 98. 90. 95. 90. 90.  93.91
      96.57  93.24 105.23 102.56 101.90 101.23  99.23  97.90 101.48 100.04 103.20 152.88 129.36 117.00 136.80 120.60 120.
     60  36.00  38.00  40.00  78.00  44.00  42.00  64.00  52.00  54.00
68   158. 84.142. 88.140. 88.140. 88.136. 88.132. 86.130. 86.130. 84.126. 84.103. 90. 95. 95. 88.100.100.101. 85. 108.56
     105.89 105.23 105.23 103.90 101.23 100.57  99.23  97.90 162.74 127.80 133.00 133.00 119.68 132.00 130.00 131.30 107.
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    89.91 90.58 85.91 88.58 87.25 85.91 83.25 85.25 167.04 120.00 85.80 81.74 88.20 75.64 82.60 82.50 87.
    00 132.00 90.00 62.00 54.00 56.00 52.00 48.00 40.00 46.00
123 128. 80.128. 80.130. 80.176. 56.150. 60.142. 70.182. 30.170. 58.154. 64. 57. 47. 40 90. 80. 95. 95. 90. 95. 95.90
    95.90 96.57 95.90 89.91 93.91 80.59 95.24 93.91 72.96 60.16 52.00 158.40 120.00 134.90 172.90 153.00 146.
    30 48.00 48.00 50.00 120.00 90.00 72.00 152.00 112.00 90.00
124 188. 30.148. 50.144. 60.140. 64.140. 64.132. 66.130. 70.128. 70.126. 72.107. 90. 80. 78. 75. 76. 77. 72. 75. 82.58
    82.58 87.91 89.24 89.24 87.91 89.91 89.24 89.91 201.16 133.20 115.20 109.20 105.00 100.32 100.10 92.16 94.
    50 158.00 98.00 84.00 76.00 76.00 66.00 60.00 58.00 54.00
125 110. 80.108. 80.112. 80.168. 66.160. 72.144. 70.184. 68.162. 76.158. 76. 53. 47. 60. 90. 53. 80.105. 90 100. 89.91
    89.24 90.58 99.90 101.23 94.57 106.56 104.56 103.23 58.30 50.76 67.20 151.20 84.80 115.20 193.20 145.80 158.
    00 30.00 28.00 32.00 102.00 88.00 74.00 116.00 86.00 82.00
126 210. 40.190. 60.158. 68.152. 68.152. 68.140. 68.142. 70.134. 70.132. 70. 93. 95. 74. 83. 75. 77. 73. 70. 76. 96.57
    103.23 97.90 95.90 95.90 91.91 93.91 91.24 90.58 195.30 180.50 116.92 126.16 114.00 107.80 103.66 93.80 100.
    32 170.00 130.00 90.00 84.00 84.00 72.00 72.00 64.00 62.00
127 106. 72.104. 72.104. 72.135. 78.128. 74.124. 76.132. 70.124. 70.122. 72. 92. 85. 77.102. 77.105 100. 90.105. 83.25
    82.58 82.58 96.90 91.91 91.91 90.58 87.91 88.58 97.52 88.40 80.08 137.70 98.56 130.20 132.00 111.60 128.
    10 34.00 32.00 32.00 57.00 54.00 48.00 62.00 54.00 50.00
128 160. 72.150. 78.128. 78.118. 74.108. 74.106. 72.104. 78.106. 78.106. 80.112. 94.100. 95. 95. 95. 95. 97. 85. 101.23
    101.90 94.57 88.58 85.25 83.25 86.58 87.25 88.58 179.20 141.00 128.00 112.10 102.60 100.70 98.80 102.82 100.
    70 88.00 72.00 50.00 44.00 34.00 34.00 26.00 28.00 26.00
129 110. 68.108. 68.108. 66.138. 56.132. 50.130. 55.142. 60.136. 62.130. 64. 87. 90. 85. 107.104.143.127 113.126. 81.92
    81.25 79.92 83.25 77.26 79.92 87.25 86.58 85.91 95.70 97.20 91.80 147.66 137.28 185.90 180.34 153.68 163.
    80 42.00 40.00 42.00 82.00 82.00 75.00 82.00 74.00 66.00
130 150. 60.142. 62.138. 64.120. 66.120. 68.120. 68.120. 70.118. 72.116. 74.130.117.115.110.107.105.100.110.105. 89.91
    88.58 88.58 83.92 85.25 85.25 86.58 87.25 87.91 195.00 166.14 158.70 132.00 128.40 126.00 120.00 129.80 121.
    80 90.00 80.00 74.00 54.00 52.00 52.00 60.00 46.00 42.00
131 112. 86.112. 84.112. 80.162. 52.146. 74.128. 70.164. 56.162. 50.140. 68. 80. 77. 77.103 83. 97.115.105.120. 94.57
    93.24 90.58 88.58 97.90 89.24 91.91 87.25 91.91 89.60 86.24 86.24 166.86 121.18 124.16 188.60 170.10 168.
    00 26.00 28.00 32.00 110.00 72.00 58.00 108.00 112.00 72.00
132 164. 60.152. 68.144. 70.136. 70.128. 70.124. 72.120. 72.116. 74.114. 76.127.110.105.102.108.100.108.103.103. 94.57
    95.90 94.57 91.91 89.24 89.24 87.91 87.91 88.58 208.28 167.20 151.20 138.72 138.24 124.00 129.60 119.48 117.
    42 104.00 84.00 74.00 66.00 58.00 52.00 48.00 42.00 38.00
133 124. 78.126. 78.120. 78.150. 60.140. 72.134. 72.150. 70.150. 72.142. 72. 47. 52. 50. 52. 45. 60. 63. 60. 65. 93.24
    93.91 91.91 89.91 94.57 92.57 96.57 97.90 95.24 58.28 65.52 60.00 78.00 63.00 80.40 94.50 90.00 92.
    30 46.00 48.00 42.00 90.00 68.00 62.00 80.00 78.00 70.00
134 164. 72.150. 76.148. 72.144. 78.126. 80.124. 80.124. 80.124. 82.122. 84. 80. 70. 73. 70. 73. 65. 63. 73. 57. 102.56
    100.57 97.24 99.90 95.24 94.57 94.57 95.90 96.57 131.20 105.00 108.04 100.80 91.98 80.60 78.12 90.52 69.
    54 92.00 74.00 76.00 66.00 46.00 44.00 44.00 42.00 38.00
135 132. 90.132. 90.184. 88.180. 72.172. 60.164. 55.208. 25.180. 54.160. 58. 45. 45. 47. 87. 60. 73.105. 85. 87. 103.90
    103.90 103.23 107.89 97.24 91.24 85.91 95.90 91.91 59.40 59.40 62.88 156.60 103.20 119.72 218.40 153.00 139.
    20 42.00 42.00 46.00 108.00 112.00 109.00 183.00 126.00 102.00
136 194. 20.176. 60.159. 68.150. 66.144. 76.150. 78.148. 78.130. 80.138. 80.112. 90. 97. 85. 65. 85. 85. 85. 90. 77.92
    98.57 98.23 93.91 98.57 101.90 101.23 96.57 99.23 217.28 158.40 154.23 127.50 93.60 127.50 125.80 110.50 124.
    20 174.00 116.00 91.00 84.00 68.00 72.00 70.00 50.00 58.00
137 130. 84.130. 86.130. 84.170. 58.168. 70.164. 76.190. 35.178. 58.170. 64. 50. 52. 55. 90. 70. 92.105.100.103. 99.23
    100.57 99.23 95.24 102.56 105.23 86.58 97.90 99.23 65.00 67.60 71.50 153.00 117.60 150.88 199.50 178.00 175.
    10 46.00 44.00 46.00 112.00 98.00 88.00 155.00 120.00 106.00
138 196. 45.170. 58.170. 64.132. 68.140. 68.140. 72.140. 80.142. 80.142. 80.123.107. 96. 93. 93. 95. 95. 90.105. 95.24
    95.24 99.23 89.24 91.91 94.57 99.90 100.57 100.57 241.08 181.90 163.20 122.76 130.20 133.00 133.00 127.80 149.
    10 151.00 112.00 106.00 64.00 72.00 68.00 60.00 62.00 62.00
139 112. 84.110. 84.112. 86.132. 70.128. 76.126. 80.144. 68.140. 76.130. 72.106. 95.115.120.112.125.135.125.136. 93.24
    92.57 94.57 90.58 93.24 95.24 93.24 97.24 91.24 118.72 104.50 128.80 158.40 143.36 157.50 194.40 175.00 176.
    80 28.00 26.00 26.00 62.00 52.00 46.00 76.00 64.00 58.00
140 142. 52.136. 70.134. 70.132. 70.126. 70.120. 70.118. 70.116. 68.110. 70.145.125.118.117.115.110.110.108.107. 81.92
    91.91 91.24 90.58 88.58 86.58 85.91 83.92 83.25 205.90 170.00 158.92 154.44 144.90 132.00 129.80 125.28 117
```

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       70  90.00  66.00  64.00  62.00  56.00  50.00  48.00  48.00  40.00
141    110. 76.112. 70.114. 70.150. 56.134. 62.130. 64.160. 30.148. 58.132. 60. 85. 70. 75.112. 87 112.120.110.113.  87.25
        83.92  84.58  87.25  85.91  85.91  73.26  87.81  83.92  93.50  78.40  85.50 168.00 116.58 145.60 192.00 162.80 149.
       16  34.00  42.00  44.00  94.00  72.00  66.00 130.00  90.00  72.00
142    160. 40.144. 56.116. 60.112. 64.112. 70.112. 70.114. 70.114. 70.112. 68.124.107. 93.100. 90. 95. 90.100. 90.  79.92
        85.25  78.59  79.82  83.92  83.92  84.58  84.58  82.58 198.40 154.08 107.88 112.00 100.80 106.40 102.60 114.00 100.
       80 120.00  88.00  56.00  48.00  42.00  42.00  44.00  44.00  44.00
143    116. 74.116. 70.118. 76.168. 20.154. 50.138. 60.174. 60.155. 62.155. 64. 76. 53. 60.120.108.110.125.120.123.  87.91
        88.25  89.91  69.26  84.58  85.91  97.90  92.91  94.24  88.16  61.48  70.80 201.60 166.32 151.80 217.50 186.00 190.
       65  42.00  46.00  42.00 148.00 104.00  78.00 114.00  93.00  91.00
144    178. 40.155. 45.140. 68.140. 68.134. 68.122. 68.120. 66.116. 64.116. 68.140.112.108.107.105. 95.100. 95.100.  85.91
        81.58  91.91  91.91  89.91  85.91  83.92  81.25  83.92 249.20 173.60 151.20 149.80 140.70 115.90 120.00 110.20 116.
       00 138.00 110.00  72.00  72.00  66.00  54.00  54.00  52.00  48.00
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14. Raw data for isokinetic exercise
    (a) mean blood pressure (V37-V48)
    (b) modified tension time index (V49-V60)
    (c) pulse pressure (V61-V72)

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1 130. 88.210. 66 200. 72.189  60 114. 79 180. 56.180. 50.172. 50 111. 77.150. 60.150. 64.170  58  60.104.102.100. 65.
115.112.118  63.112.112.115. 101.90 113.89 114.55 102.90  90.58  97.24  93.24  90.58  88.24  89.91  92.57  95.24  78
.00 218.40 204.00 189.00  74.10 207.00 201.60 202.96  69.93 168.00 168.00 195.50  42.00 144.00 128.00 129.00  35.00
124.00 130.00 122.00  34.00  90.00  86.00 112.00
2 119. 79.164. 54.190. 52.180. 50.120. 86.180. 58.176. 58.172. 50.125. 88.170. 72.190. 64.185. 64  60.145.155 160. 68.
153.160.165. 61.153.160.169.  92.24  90.58  97.90  93.24  97.24  98.57  97.24  90.58 100.23 104.56 105.89 104.23  71
.40 237.80 294.50 288.00  81.60 275.40 281.60 283.80  76.25 260 10 304.00 312.65  40.00 110.00 138.00 130.00  34.00
122.00 118.00 122.00  37.00  98.00 126.00 121.00
3 129. 82.210. 68.210. 70.210. 74.120. 89.180. 76.210. 68.220. 72.127. 91.210. 55.220. 64.220. 68. 56.132.138.144. 53.
140.140.150. 53.138.147.150.  97.57 115.22 116.55 119.21  99.23 110.56 115.22 121.21 102.90 106.56 115.88 118.55  72
.24 277.20 289.80 302.40  63.60 252.00 294.00 330.00  67.31 289.80 323.40 330.00  47.00 142.00 140.00 136.00  31.00
104.00 142.00 148.00  36.00 155.00 156.00 152.00
4 126. 68.198. 10.198. 10.190.  8.132. 79.190. 25.180. 10.178.  5.128. 80.190. 30.205. 10.200.  5. 55.130.138.128. 46.
135.150.149. 47.120.131.143.  87.25  72.59  72.59  68.60  96.57  79.92  66.60  62.60  95.90  83.25  74.92  69.93  69
.30 257.40 273.24 243.20  60.72 256.50 270.00 265.22  60.16 228.00 268.55 286.00  58.00 188.00 188.00 182.00  53.00
165.00 170.00 173.00  48.00 160.00 195.00 195.00
5 113. 77.160. 48.160. 40.190. 40.127. 85.180. 62.170. 56.200. 60.113. 79.170. 45.170. 45.160. 50. 56.137.145.150. 55
140.150.143. 54.150.155.162.  88.91  85.25  79.92  89.91  98.90 101.23  93.91 106.56  90.24  86.58  86.58  86.58  63
.28 219.20 232.00 285.00  69.85 252.00 255.00 286.00  61.02 255.00 263.50 259.20  36.00 112.00 120.00 150.00  42.00
118.00 114.00 140.00  34.00 125.00 125.00 110.00
6 126. 99.170. 60.180. 58.180. 68.122. 84.190. 68.190. 48.190. 45.130. 85.180. 60.175. 45.192. 50. 57.110.115.125. 64.
137.150.148. 53.130.139.127. 107.89  96.57  98.57 105.23  96.57 108.56  95.24  93.24  99.90  99.90  88.24  97.24  71
.82 187.00 207.00 225.00  78.08 260.30 285.00 281.20  68.90 234.00 243.25 243.84  27.00 110.00 122.00 112.00  38.00
122.00 142.00 145.00  45.00 120.00 130.00 142.00
7 114. 85.190. 60.192. 64.189. 58.121. 80.170. 50.180. 40.210. 38.119. 90.180. 44.182. 40.176. 38. 83.115.123.137. 66.
115.118.130. 80.135.140.140.  94.57 103.23 106.56 101.56  93.57  89.91  86.58  95.24  99.57  89.24  87.25  83.92  94
.62 218.50 236.16 258.93  79.86 195.50 212.40 273.00  95.20 243.00 254.80 246.40  29.00 130.00 128.00 131.00  41.00
120.00 140.00 172.00  29.00 136.00 142.00 138.00
8 118. 82.160. 64.160. 52.148. 60.118. 84.170. 68.168. 70.170. 62 118. 82.180. 62.168. 55.170. 60. 59.113.115.128. 74.
150.158.150. 60.135.142.150.  93.91  95.90  87.91  89.24  95.24 101.90 102.56  97.90  93.91 101.23  92.57  96.57  69
.62 180.80 184.00 189.44  87.32 255.00 265.44 255.00  70.80 243.00 238.56 255.00  36.00  96.00 108.00  88.00  34.00
102.00  98.00 108.00  36.00 118.00 113.00 110.00
9 135. 93.150. 68.155. 76.160. 72.127. 97.170. 62.180. 72.178. 70.127. 96.170. 76.184. 82.190. 78. 69.135.143.147. 73.
132.140.148. 70.127.140.167. 106.89  95.24 102.23 101.23 106.89  97.90 107.89 105.89 106.23 107.23 115.88 115.22  93
.15 202.50 221.65 235.20  92.71 224.40 252.00 263.44  88.90 215.90 257.60 317.30  42.00  82.00  79.00  88.00  30.00
108.00 108.00 108.00  31.00  94.00 102.00 112.00
10 112. 65.198. 56.164. 50.166. 60.110. 76.156. 64.184. 56.180. 68.106. 75.152. 68.170. 66.170. 54. 61.118.125.135. 60.
128.140.145. 60.135.145.152.  80.59 103.23  87.91  95.24  87.25  94.57  98.57 105.23  85.25  95.90 100.57  92.57  68
.32 233.64 205.00 224.10  66.00 199.68 257.60 261.00  63.60 205.20 246.50 258.40  47.00 142.00 114.00 106.00  34.00
92.00 128.00 112.00  31.00  84.00 104.00 116.00
11 131. 85.188. 58.192. 72.194. 68.117. 74.180. 45.192. 28.194. 28.129. 86.168. 48.188. 32.190. 35. 59.120.142.146. 52.
134.150.153. 44.142.153.160. 100.23 101.23 111.89 109.89  88.24  89.91  82.58  83.25 100.23  87.91  83.92  86.58  77
.29 225.60 272.64 283.24  60.84 241.20 288.00 296.82  56.76 238.56 287.64 304.00  46.00 130.00 120.00 126.00  43.00
135.00 164.00 166.00  43.00 120.00 156.00 155.00
12 121. 83.190. 50.190. 45.190. 50.123. 88.168. 72.192. 72.196. 58.114  84.160. 38.179. 40.172. 40. 83.135.126.140. 70.
116.120.125. 81.144.148.153.  95.57  96.57  93.24  96.57  99.57 103.90 111.89 103.90  93.91  78.59  86.25  83.92 100
.43 256.50 239.40 266.00  86.10 194.88 230.40 245.00  92.34 230.40 264.92 263.16  38.00 140.00 145.00 140.00  35.00
96.00 120.00 138.00  30.00 122.00 139.00 132.00
13 119. 84.168. 54.170. 45.168. 48.117. 72.158. 25.158. 10.170. 15.120. 87.160. 38.168. 28.160. 30. 63. 90.113.112. 80.
130.135.142. 65.125.133.135.  95.57  91.91  86.58  87.91  86.91  69.26  59.27  66.60  97.90  78.59  74.59  73.26  74
.97 151.20 192.10 188.16  93.60 205.40 213.30 241.40  78.00 200.00 223.44 216.00  35.00 114.00 125.00 120.00  45.00
130.00 148.00 155.00  33.00 122.00 140.00 130.00
14 108. 78.164. 70.170. 68.168. 64.106. 76.150. 48.170. 52.158. 48.109. 81.168. 55.160. 60.160. 60. 47.108.133.142. 49.
142.145.157. 51.140.150.157.  87.91 101.23 101.90  98.57  85.91  81.92  91.24  84.58  90.24  92.57  93.24  93.24  50
.76 177.12 226.10 238.56  51.94 213.00 246.50 248.06  55.59 235.20 240.00 251.20  30.00  94.00 102.00 104.00  30.00
102.00 118.00 110.00  28.00 113.00 100.00 100.00
15 113. 69.192. 20.189. 10.202. 10.115. 74.192. 20.194. 10.199. 10.123. 74.176. 20.205. 10.215.  5. 60.136.152.155. 61.
145.146.148. 56.137.143.145.  83.58  77.26  69.60  73.93  87.58  77.26  71.26  72.93  90.24  71.93  74.92  74.92  67
.80 261.12 287.28 313.10  70.15 278.40 283.24 294.52  68.88 241.12 293.15 311.75  44.00 172.00 179.00 192.00  41.00
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    172.00 184.00 189.00  49.00 156.00 195.00 210.00
16  116. 78.205. 72.205  55.210. 60.117. 78.170. 50.172. 64.178. 40.117. 83.170. 60.180. 40.190. 50. 52.140.152.153. 53.
    143.150.152. 52.150.160.160.  90.58 116.22 104.89 109.89  90.91  89.91  99.90  85.91  94.24  96.57  86.58  96.57  60
    .32 287.00 311.60 321.30  62.01 243.10 258.00 270.56  60.84 255.00 288.00 304.00  38.00 133.00 150.00 150.00  39.00
    120.00 108.00 138.00  34.00 110.00 140.00 140.00
17  129. 86.188. 54.180. 42.196. 38.116. 89.199. 55.188. 30.176. 40.123. 88.192. 40.196. 46.196. 40. 81.135.135.145. 64.
    138.146.159. 69.155.160.166. 100.23  98.57  87.91  90.58  97.90 102.90  82.58  85.25  99.57  90.58  95.90  91.91 104
    .49 253.80 243.00 284.20  74.24 274.62 274.48 279.84  84.87 297.60 313.60 325.36  43.00 134.00 138.00 158.00  27.00
    144.00 158.00 136.00  35.00 152.00 150.00 156.00
18  113. 81.160. 54.164. 38.158. 15.113. 77.158. 25.150. 20.158. 40.107. 78.144. 40.148. 30.152. 25. 52.162.174.183. 70.
    193.205.207. 64.183.190.193.  91.57  89.24  79.92  62.60  88.91  69.26  63.27  79.25  87.58  74.59  69.26  67.27  58
    .76 259.20 285.36 289.14  79.10 304.94 307.50 327.06  68.48 263.52 281.20 293.36  32.00 106.00 126.00 143.00  36.00
    133.00 130.00 118.00  29.00 104.00 118.00 127.00
19  115. 85.148. 40.152. 30.158. 20.127. 89.146. 45.160. 30.170. 30.117. 88.158. 35.160. 25.158. 20. 42.125.142.142. 53.
    123.136.138. 44.133.143.153.  94.90  75.92  70.60  65.93 101.56  78.59  73.26  76.59  97.57  75.92  69.93  65.93  48
    .30 185.00 215.84 224.36  67.31 179.58 217.60 234.60  51.48 210.14 228.80 241.74  30.00 108.00 122.00 138.00  38.00
    101.00 130.00 140.00  29.00 123.00 135.00 138.00
20  114. 73.140. 52.142. 35.150. 40.103. 74.142. 50.164. 48.160. 50.111. 76.146. 58.158. 52.150. 58. 64.100.105.112. 64.
    125.133.138. 59.115.132.127.  86.58  81.25  70.60  76.59  83.58  80.59  86.58  86.58  87.58  87.25  87.25  88.58  72
    .96 140.00 149.10 168.00  65.92 177.50 218.12 220.80  65.49 167.90 208.56 190.50  41.00  88.00 107.00 110.00  29.00
    92.00 116.00 110.00  35.00  88.00 106.00  92.00
21  112. 84.170. 15.182.  5.190.  5.130. 83.182. 20.186. 10.192. 10.110. 81.190. 24.198. 15.210. 15. 43.143.155.162. 49.
    150.166.172. 51.147.163.170.  93.24  66.60  63.94  66.60  98.57  73.93  68.60  70.60  90.58  79.25  75.92  78.82  48
    .16 243.10 282.10 307.80  63.70 273.00 308.76 330.24  56.10 279.30 322.74 357.00  28.00 155.00 177.00 185.00  47.00
    162.00 176.00 182.00  29.00 166.00 183.00 195.00
22  106. 72.162. 40.158. 42.158. 32.109. 68.140. 30.145. 30.158. 20.113. 84.170. 10.178. 10.178  10. 84.165.174.195. 85.
    175.183.187. 80.177.187.193.  83.25  80.59  80.59  73.93  81.58  66.60  68.26  65.93  93.57  63.27  65.93  65.93  89
    .04 267.30 274.92 308.10  92.65 245.00 265.35 295.46  90.40 300.90 332.86 343.54  34.00 122.00 116.00 126.00  41.00
    110.00 115.00 138.00  29.00 160.00 168.00 168.00
23  125. 79.162. 55.168. 30.166. 20.132. 90.196.  5.190. 10.190.  5.131. 84.192. 15.197. 16.198. 10. 50.130.146.163. 49.
    165.175.175. 52.158.175.173.  94.24  90.58  75.92  68.60 103.90  68.60  69.93  66.60  99.57  73.93  76.26  72.59  62
    .50 210.60 245.28 270.58  64.68 323.40 332.50 332.50  68.12 303.36 344.75 342.54  46.00 107.00 138.00 146.00  42.00
    191.00 180.00 185.00  47.00 177.00 181.00 188.00
24  114. 84.140. 25.148. 10.152. 20.113. 73.155. 10.168.  5.168. 10.116. 74.162. 10.170. 10.174  10.105.163.185.190. 77.
    180.187.193. 63.186.190.195.  93.91  63.27  55.94  63.94  86.25  58.27  59.27  62.60  87.91  60.61  63.27  64.60 119
    .70 228.20 273.80 288.80  87.01 279.00 314.16 324.24  73.08 301.32 323.00 339.30  30.00 115.00 138.00 132.00  40.00
    145.00 163.00 158.00  42.00 152.00 160.00 164.00
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15. Raw data for isometric rest-quadriceps
    (a) mean blood pressure (V16-V20)
    (b) modified tension time index (V21-V25)
    (c) pulse pressure (V26-V30)

1	122. 82.122. 84.120. 84.118. 90.120. 90. 70. 87. 80. 78. 80.	92.04 96.00 40.00 38.00 36.00 28.00 30.00	95.24	96.57	95.90	99.23	99.90	85.40	106.14	96.00
2	120. 84.120. 82.122. 84.122. 88.120. 90. 68. 72. 75. 77. 75.	93.94 90.00 36.00 38.00 38.00 34.00 30.00	95.90	94.57	96.57	99.23	99.90	81.60	86.40	91.50
3	120. 88.122. 88.118. 88.118. 90.120. 90. 62. 63. 68. 57. 75.	67.26 90.00 32.00 34.00 30.00 28.00 30.00	98.57	99.23	97.90	99.23	99.90	74.40	76.86	80.24
4	132. 90.132. 84.128. 80.130. 96.130. 94. 58. 50. 52. 52. 75.	67.60 97.50 42.00 48.00 48.00 34.00 36.00	103.90	99.90	95.90	107.23	105.89	76.56	66.00	66.56
5	1[illegible]0. 90.124. 90.126. 90.126. 92.126.100. 63. 60. 67. 70. 65.	88.20 81.90 40.00 34.00 36.00 34.00 26.00	103.23	101.23	101.90	103.23	108.56	81.90	74.40	84.42
6	[illegible]10. 80.110. 78.118. 76.120. 84.118. 76. 55. 55. 52. 55. 60.	66.00 70.80 30.00 32.00 42.00 36.00 42.00	89.91	88.58	89.91	95.90	89.81	60.50	60.50	61.36
7	120. 84.120. 98.118. 86.120. 78.122. 92. 80. 88. 83. 65. 82.	78.00 100.04 36.00 22.00 32.00 42.00 30.00	95.90	105.23	96.57	91.91	101.90	96.00	105.60	97.94
8	140.100.142.100.140.100.142.100.146.100. 70. 68. 70. 62. 70.	88.04 102.20 40.00 42.00 40.00 42.00 46.00	113.22	113.89	113.22	113.89	115.22	98.00	96.56	98.00
9	124. 92.122. 92.124. 90.124. 92.124. 92. 62. 63. 60. 59. 80.	73.16 99.20 32.00 30.00 34.00 32.00 32.00	102.56	101.90	101.23	102.56	102.56	76.88	76.86	74.40
10	104. 78.106. 78.108. 74.110. 76.104. 76. 60. 67. 62. 62. 80.	68.20 83.20 26.00 28.00 34.00 34.00 28.00	86.58	87.25	85.25	87.25	85.25	62.40	71.02	66.96
11	128. 80.128. 84.128. 80.128. 80.128. 86. 60. 65. 63. 67. 75.	85.76 96.00 48.00 44.00 48.00 48.00 42.00	95.90	98.57	95.90	95.90	99.90	76.80	83.20	80.64
12	112. 78.110. 76.110. 76.110. 78.112. 84. 50. 50. 50. 53. 70.	58.30 78.40 34.00 34.00 34.00 32.00 28.00	89.24	87.25	87.25	88.58	93.24	56.00	55.00	55.00
13	118. 84.118. 88.120. 86.118. 86.122. 88. 60. 60. 65. 80. 85.	94.40 103.70 34.00 30.00 34.00 32.00 34.00	95.24	97.90	97.24	96.57	99.23	70.80	70.80	78.00
14	112. 90.112. 90.112. 88.112. 88.112. 88. 65. 73. 73. 68. 67.	76.16 75.04 22.00 22.00 24.00 24.00 24.00	97.24	97.24	95.90	95.90	95.90	72.80	81.76	81.76
15	112. 72.114. 70.116. 76.114. 80.116. 70. 56. 63. 58. 75. 85.	85.50 98.60 40.00 44.00 40.00 34.00 46.00	85.25	84.58	89.24	91.24	85.25	62.72	71.82	67.28
16	110. 80.106. 76.110. 80.108. 80.114. 84. 58. 50. 83. 54. 85.	58.32 96.90 30.00 30.00 30.00 28.00 30.00	89.81	85.91	89.91	88.24	93.81	63.80	53.00	91.30
17	120. 90.130. 94.132. 94.134. 94.136. 98. 62. 74. 57. 70. 75.	93.80 102.00 30.00 36.00 38.00 40.00 38.00	99.90	105.89	106.56	107.23	110.56	74.40	96.20	75.24
18	112. 76.110. 80.118. 80.116. 78.116. 80. 70. 55. 70. 70. 64.	81.20 74.24 36.00 30.00 38.00 38.00 36.00	87.91	89.91	92.57	90.58	91.81	78.40	60.50	82.60
19	126. 92.128. 90.128. 90.128. 90.128. 90. 65. 56. 56. 62. 62.	79.36 79.36 34.00 38.00 38.00 38.00 38.00	103.23	102.56	102.56	102.56	102.56	81.90	71.68	71.68
20	110. 90.110. 88.112. 88.112. 88.112. 88. 45. 55. 45. 40. 80.	44.80 89.60 20.00 22.00 24.00 24.00 24.00	96.57	95.24	95.90	95.90	95.90	49.50	60.50	50.40
21	108. 70.106. 66.108. 68.108. 70.110. 70. 55. 62. 64. 60. 50.	64.80 55.00 38.00 40.00 40.00 38.00 40.00	82.58	79.25	81.25	82.58	83.25	59.40	65.72	69.12
22	112. 80.110. 76.108. 80.110. 78.110. 80. 87. 85. 87. 87.108.	95.70 118.80 32.00 34.00 28.00 32.00 30.00	90.58	87.25	89.24	88.58	89.91	97.44	93.50	93.96
23	106. 68.104. 68.104. 68.104. 68.104. 70. 60. 61. 72. 65. 70.	67.60 72.80 38.00 36.00 36.00 36.00 34.00	80.59	79.92	79.92	79.92	81.25	63.60	63.44	74.88
24	128. 82.126. 82.126. 82.126. 80.126. 84. 65. 58. 58. 68. 74.	85.68 93.24 46.00 44.00 44.00 46.00 42.00	97.24	96.57	96.57	95.24	97.90	83.20	73.08	73.08
25	120. 84.120. 84.124. 84.122. 86.122. 88. 80. 80. 80. 75. 83.	91.50 101.26 36.00 36.00 40.00 36.00 34.00	95.90	[illegible]	97.24	97.90	99.23	96.00	96.00	99.20
26	130. 90.128. 88.120. 90.122. 90.122. 88. 86. 83. 86. 78. 85.	95.16 103.70 40.00 40.00 30.00 32.00 34.00	103.23	101.23	99.90	100.57	99.23	111.80	106.24	103.20
27	138. 84.136. 88.128. 88.132. 92.132. 90. 60. 65. 59. 50. 70.	66.00 92.40 54.00 48.00 40.00 40.00 42.00	101.90	103.90	101.23	105.23	103.90	82.80	88.40	75.52
28	140. 88.128. 86.138. 90.138. 88.140. 90. 65. 57. 65. 60. 70.	82.80 98.00 52.00 42.00 48.00 50.00 50.00	105.23	99.90	105.89	104.56	106.56	91.00	72.96	89.70
29	120. 88.120. 90.118. 90.122. 94.130.100. 65. 60. 78. 73. 68.	89.06 88.40 32.00 30.00 28.00 28.00 30.00	98.57	99.90	99.23	103.23	109.89	78.00	72.00	92.04
30	142. 82.134. 72.132. 70.132. 68.132. 68. 63. 60. 62. 48. 61.		101.90	92.57	90.58	89.24	89.24	89.46	80.40	81.84

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    63.36  80.52  60.00  62.00  62.00  64.00  64.00
31  120. 84.120. 84.120. 90.120. 90.120. 92. 84. 82. 80. 73. 95. 95.90 95.90 99.90 99.90 101.23 100.80 98.40 96.00
    87.60 114.00  36.00  36.00  30.00  30.00  28.00
32  155.108 153.100 144. 98.142. 98.144. 98. 75. 65. 68. 63. 80. 123.54 117.55 113.22 112.55 113.22 116.25 99.45 97.92
    89.46 115.20  47.00  53.00  46.00  44.00  46.00
33  130. 96.128. 96.132. 90.130. 98.130. 96. 65. 67. 60. 68. 65. 107.23 106.56 103.90 108.56 107.23 84.50 85.76 79.20
    88.40  84.50  34.00  32.00  42.00  32.00  34.00
34  126. 72.110. 72.110. 80.108. 78.108. 76. 70. 75. 75. 65. 63. 89.91 84.58 89.91 87.91 86.58 88.20 82.50 82.50
    70.20  68.04  54.00  38.00  30.00  30.00  32.00
35  138. 80.124. 86.132. 78.132. 84.132. 86. 60. 60. 70. 67. 86. 99.23 98.57 95.90 99.90 101.23 82.80 74.40 92.40
    88.44 113.52  58.00  38.00  54.00  48.00  46.00
36  120. 80.112. 80.112. 80.110. 80.110. 80. 50. 53. 53. 52. 55. 93.24 90.58 90.58 89.91 89.91 60.00 59.36 59.36
    57.20  60.50  40.00  32.00  32.00  30.00  30.00
37  120. 84.118. 84.116. 84.116. 86.116. 86. 63. 68. 66. 66. 60. 95.90 95.24 94.57 95.90 95.90 75.60 80.24 76.56
    76.56  69.60  36.00  34.00  32.00  30.00  30.00
38  120. 88.120. 86.120. 84.120. 86.120. 86. 67. 68. 72. 75. 87. 98.57 97.24 95.90 97.24 97.24 80.40 81.60 86.40
    90.00 104.40  32.00  34.00  36.00  34.00  34.00
39  140. 78.136. 78.124. 74.130. 76.124. 78. 73. 74. 70. 58. 88. 98.57 97.24 90.58 93.91 93.24 102.20 100.64 86.80
    75.40 109.12  62.00  58.00  50.00  54.00  46.00
40  115. 88.112. 84.112. 86.110. 84.110. 84. 70. 67. 70. 58. 80. 96.90 93.24 94.57 92.57 92.57 80.50 75.04 78.40
    63.80  88.00  27.00  28.00  26.00  26.00  26.00
41  144. 94.136. 98.136. 98.140.100.142.100. 65. 77. 66. 70. 72. 110.56 110.56 110.56 113.22 113.89 93.60 104.72 89.76
    98.00 102.24  50.00  38.00  38.00  40.00  42.00
42  128. 76.118. 76.118. 76.120. 76.116. 74. 77. 60. 77. 55. 78. 93.24 89.91 89.91 90.58 87.91 98.56 70.80 90.86
    66.00  90.48  52.00  42.00  42.00  44.00  42.00
43  120. 88.120. 90.118. 90.116. 90.124. 90. 43. 60. 60. 55. 68. 98.57 99.90 99.23 98.57 101.23 51.60 72.00 70.80
    63.80  84.32  32.00  30.00  28.00  26.00  34.00
44  128. 76.130. 78.128. 78.128. 86.124. 80. 48. 46. 55. 47. 75. 93.24 95.24 94.57 99.90 94.57 61.44 59.80 70.40
    60.16  93.00  52.00  52.00  50.00  42.00  44.00
45  118. 70.116. 70.110. 70.112. 70.110. 70. 60. 50. 73. 55. 67. 85.91 85.25 83.25 83.92 83.25 70.80 58.00 80.30
    61.60  73.70  48.00  46.00  40.00  42.00  40.00
46  120. 80.122. 84.108. 80.112. 86.110. 88.106.105.111.100.113. 93.24 96.57 89.24 94.57 95.24 127.20 128.10 119.88
   112.00 124.30  40.00  38.00  28.00  26.00  22.00
47  106. 68.100. 70.100. 70.100. 70.100. 68. 65. 65. 60. 65. 62. 80.59 79.92 79.92 79.92 78.59 68.90 65.00 60.00
    65.00  62.00  38.00  30.00  30.00  30.00  32.00
48  130. 84.130. 88.138. 86.132. 84.132. 86. 70. 62. 68. 63. 73. 99.23 101.90 103.23 99.90 101.23 91.00 80.60 93.84
    83.16  96.36  46.00  42.00  52.00  48.00  46.00
49  130. 92.128. 86.130. 84.128. 88.126. 80. 87. 83. 78. 74. 76. 104.56 99.90 99.23 101.23 95.24 113.10 106.24 101.40
    94.72  95.76  38.00  42.00  46.00  40.00  46.00
50  140. 96.130. 92.130.112.128. 90.130. 92. 93. 82. 90. 80. 80. 110.56 104.56 117.88 102.56 104.56 130.20 106.60 117.00
   102.40 104.00  44.00  38.00  18.00  38.00  38.00
51  132. 80.132. 80.130. 70.128. 84.118. 84. 65. 62. 62. 64. 72. 97.24 97.24 89.91 98.57 95.24 85.80 81.84 80.60
    81.92  84.96  52.00  52.00  60.00  44.00  34.00
52  150.100.160.110.154. 94.140. 90.140. 96. 75. 62. 60. 50. 53. 116.55 126.54 113.89 106.56 110.56 112.50 99.20 92.40
    70.00  74.20  50.00  50.00  60.00  50.00  44.00
53  128. 96.120. 94.124. 90.130. 88.124. 92. 74. 80. 83. 75. 70. 106.56 102.56 101.23 101.90 102.56 94.72 96.00 102.92
    97.50  86.80  32.00  26.00  34.00  42.00  32.00
54  140. 80.130. 64.128. 64.124. 66.130. 68. 65. 55. 53. 54. 57. 99.90 85.91 85.25 85.25 88.58 91.00 71.50 67.84
    66.96  74.10  60.00  66.00  64.00  58.00  62.00
55  120. 88.130. 90.125. 84.120. 90.122. 90. 85. 87. 65. 90. 78. 98.57 103.23 97.57 99.90 100.57 102.00 113.10 81.25
   108.00  95.16  32.00  40.00  41.00  30.00  32.00
56  144. 96.146. 94.146. 96.138. 98.140. 98. 56. 61. 71. 60. 68. 111.89 111.22 112.55 111.22 111.89 80.64 89.06 103.66
    82.80  95.20  48.00  52.00  50.00  40.00  42.00
57  146. 96.134. 90.130. 88.132. 88.130. 88. 77. 65. 60. 64. 70. 112.55 104.56 101.90 102.56 101.90 112.42 87.10 78.00
    84.48  91.00  50.00  44.00  42.00  44.00  42.00
58  120. 70.118. 76.112. 76.112. 70.110. 74. 70. 69. 68. 58. 65. 86.58 89.91 87.91 83.92 85.91 84.00 81.42 76.16
    64.96  71.50  50.00  42.00  36.00  42.00  36.00
59  140. 84.134. 82.128. 82.134. 82.132. 86. 75. 80. 70. 62. 83. 102.56 99.23 97.24 89.23 101.23 105.00 107.20 89.60
    83.08 109.56  56.00  52.00  46.00  52.00  46.00
60  122. 84.120. 80.120. 78.120. 80.118. 76. 63. 55. 47. 60. 47. 96.57 93.24 91.91 93.24 89.91 76.86 66.00 56.40
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      72.00  55.46  38.00  40.00  42.00  40.00  42.00
61   122. 78.112. 84.114. 78.114. 78.112. 76. 96. 60. 57. 70. 74.   92.57  93.24  89.91  89.91  87.91 117.12  67.20  64.98
      79.80  82.88  44.00  28.00  36.00  36.00  36.00
62   124. 80.120. 80.122. 84.120. 86.122. 90. 77. 80. 73. 72. 63.   94.57  93.24  96.57  97.24 100.57  95.48  96.00  89.06
      86.40  76.86  44.00  40.00  38.00  34.00  32.00
63   140. 64.138. 70.138. 74.130. 76.116. 72. 70. 70. 56. 65. 68.   89.24  92.57  95.24  93.91  86.58  98.00  96.60  77.28
      84.50  78.88  76.00  68.00  64.00  54.00  44.00
64   122. 86.114. 72.112. 80.112. 82.114. 82. 68. 53. 52. 58. 72.   97.90  85.91  90.58  91.91  92.57  82.96  60.42  58.24
      64.96  82.08  36.00  42.00  32.00  30.00  32.00
65   148. 90.148. 88.132. 94.130. 88.130. 92. 66. 67. 62. 65. 70.  109.22 107.89 106.56 101.90 104.56  97.68  99.16  81.84
      84.50  91.00  58.00  60.00  38.00  42.00  38.00
66   130. 70.118. 72.110. 74.114. 78.114. 78. 74. 68. 80. 85. 73.   89.91  87.25  85.91  89.91  89.91  96.20  80.24  88.00
      96.90  83.22  60.00  46.00  36.00  36.00  36.00
67   142. 80.130. 84.128. 88.130. 88.128. 88. 75. 60. 57. 50. 56.  100.57  99.23 101.23 101.90 101.23 106.50  78.00  72.96
      65.00  71.68  62.00  46.00  40.00  42.00  40.00
68   144. 70.130. 70.126. 76.126. 78.130. 76. 60. 67. 48. 60. 48.   94.57  89.91  92.57  93.91  93.91  86.40  87.10  60.48
      75.60  62.40  74.00  60.00  50.00  48.00  54.00
69   120. 66.120. 64.114. 64.110. 68.108. 64. 65. 58. 53. 52. 85.   83.92  82.58  80.59  81.92  78.59  78.00  69.60  60.42
      57.20  91.80  54.00  56.00  50.00  42.00  44.00
70   128. 86.118. 78.118. 78.118. 80.120. 80.112. 92.102. 103. 98.  99.90  91.24  91.24  92.57  93.24 143.36 108.56 120.36
     121.54 117.60  42.00  40.00  40.00  38.00  40.00
71   110. 60.104. 60.100. 64.104. 70.104. 70. 67. 60. 56. 57. 65.   76.59  74.59  75.92  81.25  81.25  73.70  62.40  56.00
      59.28  67.60  50.00  44.00  36.00  34.00  34.00
72   138. 80.140. 86.134. 86.138. 86.136. 86. 70. 65. 70. 67. 70.   98.57 103.90 101.90 103.23 102.56  95.20  91.00  93.80
      92.46  95.20  56.00  54.00  48.00  52.00  50.00
73   122. 88.122. 90.122. 88.122. 84.122. 86. 70. 80. 73. 78. 84.   99.23 100.57  99.23  96.57  97.90  85.40  97.60  89.06
      95.16 102.48  34.00  32.00  34.00  38.00  36.00
74   130. 96.128. 96.110. 90.110. 92.110. 94. 90. 92. 83. 87. 97.  107.23 106.56  96.57  97.90  99.23 117.00 117.76  91.30
      95.70 106.70  34.00  32.00  20.00  18.00  16.00
75   130. 90.128. 88.128. 80.128. 80.126. 86. 70. 77. 52. 50. 67.  103.23 101.23  95.90  95.90  99.23  91.00  98.56  66.56
      64.00  84.42  40.00  40.00  48.00  48.00  40.00
76   140. 90.138. 88.140. 88.138. 88.142. 90. 67. 62. 59. 70. 55.  106.56 104.56 105.23 104.56 107.23  93.80  85.56  82.60
      96.60  78.10  50.00  50.00  52.00  50.00  52.00
77   138. 90.128. 88.128. 90.120. 84.122. 90. 80. 75. 73. 74. 70.  105.89 101.23 102.56  95.90 100.57 110.40  96.00  93.44
      88.80  85.40  48.00  40.00  38.00  36.00  32.00
78   150. 80.140. 84.144. 74.130. 70.132. 68. 56. 57. 59. 63. 58.  103.23 102.56  97.24  89.91  89.24  84.00  79.80  84.96
      81.90  76.56  70.00  56.00  70.00  60.00  64.00
79   132. 82.122. 98.124. 92.118. 80.120. 82. 83. 95. 80. 77. 90.   98.57 105.89 102.56  92.57  94.57 109.56 115.90  99.20
      90.86 108.00  50.00  24.00  32.00  38.00  38.00
80   158.108.142.100.144. 98.144.100.144. 98. 80. 60. 62. 65. 58.  124.54 113.89 113.22 114.55 113.22 126.40  85.20  89.28
      93.60  83.52  50.00  42.00  46.00  44.00  46.00
81   140. 92.134. 92.128. 90.128. 94.128. 88. 68. 68. 65. 68. 67.  107.89 105.89 102.56 105.23 101.23  95.20  91.12  83.20
      87.04  85.76  48.00  42.00  38.00  34.00  40.00
82   120. 72.112. 80.112. 72.112. 72.114. 70. 72. 82. 63. 65. 67.   87.91  90.58  85.25  85.25  84.58  86.40  91.84  70.56
      72.80  76.38  48.00  32.00  40.00  40.00  44.00
83   146. 80.146. 78.144. 78.140. 80.136. 80. 64. 65. 58. 63. 70.  101.90 100.57  99.90  99.90  98.57  93.44  94.90  83.52
      88.20  95.20  66.00  68.00  66.00  60.00  56.00
84   120. 80.110. 76.110. 76.108. 76.110. 76. 53. 50. 45. 60. 53.   93.24  87.25  87.25  86.58  87.25  63.60  55.00  49.50
      64.80  58.30  40.00  34.00  34.00  32.00  34.00
85   124. 84.122. 84.116. 84.116. 82.114. 80. 63. 63. 67. 60. 65.   97.24  96.57  94.57  93.24  91.24  78.12  76.86  77.72
      69.60  74.10  40.00  38.00  32.00  34.00  34.00
86   126. 90.128. 86.119. 86.118. 86.118. 86. 82. 77. 68. 73. 70.  101.90  99.90  96.90  96.57  96.57 103.32  98.56  80.92
      86.14  82.60  36.00  42.00  33.00  32.00  32.00
87   136. 80.130. 76.132. 84.134. 78.136. 76. 72. 75. 72. 65. 72.   98.57  93.91  99.90  96.57  95.90  97.92  97.50  95.04
      87.10  97.92  56.00  54.00  48.00  56.00  60.00
88   122. 82.112. 78.110. 80.110. 82.110. 80. 60. 50. 60. 55. 70.   95.24  89.24  89.91  91.24  89.91  73.20  56.00  66.00
      60.50  77.00  40.00  34.00  30.00  28.00  30.00
89   138. 90.136. 90.126. 90.126. 92.124. 94. 74. 68. 65. 68. 68.  105.89 105.23 101.90 103.23 103.90 102.12  92.48  81.90
      85.68  84.32  48.00  46.00  36.00  34.00  30.00
90   128. 70.124. 72.122. 72.118. 74.122. 76. 63. 98. 87. 75. 65.   89.24  89.24  88.58  88.58  91.24  80.64 121.52 106.14
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        88.50  79.30  58.00  52.00  50.00  44.00  46.00
91     130. 88.128. 88.126. 90.126. 90.124  90. 63. 55. 53. 65. 63.  101.90 101.23 101.90 101.90 101.23  81.90  70.40  66.78
        81.90  78.12  42.00  40.00  36.00  36.00  34.00
92     132. 76.120. 80.134. 90.134. 90.140. 82. 70. 77. 65. 55. 65.   94.57  93.24 104.56 104.56 101.23  92.40  92.40  87.10
        73.70  91.00  56.00  40.00  44.00  44.00  58.00
93     122. 56.118. 60.110. 60.110. 68.112. 70. 75. 52. 67. 50. 80.   77.92  79.25  76.59  81.92  83.92  91.50  61.36  73.70
        55.00  89.60  66.00  58.00  50.00  42.00  42.00
94     110. 90.118. 86.130. 88.128. 86.126. 80.112.110.105.100.103.   96.57  96.57 101.90  99.90  95.24 123.20 129.80 136.50
       128.00 129.78  20.00  32.00  42.00  42.00  46.00
95     110. 70.108. 68.108. 70.104. 68.104  70. 70. 70. 60. 60. 67.   83.25  81.25  82.58  79.92  81.25  77.00  75.60  64.80
        62.40  69.68  40.00  40.00  38.00  36.00  34.00
96     138. 84.134. 80.134. 80.136. 80.136. 80. 64. 60. 53. 56. 53.  101.90  97.90  97.90  98.57  98.57  88.32  80.40  71.02
        76.16  72.08  54.00  54.00  54.00  56.00  56.00
97     130. 90.124. 88.124. 88.118. 80.120. 84. 83. 82. 73. 73. 72.  103.23  99.90  99.90  92.57  95.90 107.90 101.68  90.52
        86.14  86.40  40.00  36.00  36.00  38.00  36.00
98     122. 90.122. 90.124. 90.112. 90.118. 90. 90. 83. 82. 85. 87.  100.57 100.57 101.23  97.24  99.23 109.80 101.26 101.68
        95.20 102.66  32.00  32.00  34.00  22.00  28.00
99     132. 86.126. 80.124. 80.120. 88.118. 90. 65. 60. 55. 59. 62.  101.23  95.24  94.57  98.57  99.23  85.80  75.60  68.20
        70.80  73.16  46.00  46.00  44.00  32.00  28.00
100    156. 98.148. 90.138. 88.138. 88.138  84. 62. 53. 55. 55. 52.  117.22 109.22 104.56 104.56 101.90  96.72  78.44  75.90
        75.90  71.76  58.00  58.00  50.00  50.00  54.00
101    138. 98.130. 98.130. 90.120. 90.120. 92. 77. 76. 75. 74. 85.  111.22 108.56 103.23  99.90 101.23 106.26  98.80  97.50
        88.80 102.00  40.00  32.00  40.00  30.00  28.00
102    130. 76.128. 74.126. 70.127. 70.122. 72. 55. 54. 57. 60. 58.   93.91  91.91  88.58  88.91  88.58  71.50  69.12  71.82
        76.20  70.76  54.00  54.00  56.00  57.00  50.00
103    122. 84.120. 80.124. 82.124. 80.122. 82. 86. 79. 75. 80. 78.   96.57  93.24  95.90  94.57  95.24 104.92  94.80  93.00
        99.20  95.16  38.00  40.00  42.00  44.00  40.00
104    152.110.154.110.144. 96.146. 96.140. 96. 72. 65. 58. 75. 58.  123.88 124.54 111.89 112.55 110.56 109.44 100.10  83.52
       109.50  81.20  42.00  44.00  48.00  50.00  44.00
105    132. 98.138.100.130.100.130. 98.130. 94. 78. 77. 65. 72. 63.  109.22 112.55 109.89 108.56 105.89 102.96 106.26  84.50
        93.60  81.90  34.00  38.00  30.00  32.00  36.00
106    112. 80.110. 72.104. 72.102. 76.102. 74. 67. 61. 62. 66. 60.   90.58  84.58  82.58  84.58  83.25  75.04  67.10  64.48
        67.32  61.20  32.00  38.00  32.00  26.00  28.00
107    150. 80.142. 82.140. 86.138. 86.130  80. 85. 75. 67. 70. 72.  103.23 101.90 103.90 103.23  96.57 127.50 106.50  93.80
        96.60  93.60  70.00  60.00  54.00  52.00  50.00
108    124. 80.120. 82.122. 80.120. 78.118. 84. 53. 53. 43. 52. 56.   94.57  94.57  93.91  91.91  95.24  65.72  63.60  52.46
        62.40  66.08  44.00  38.00  42.00  42.00  34.00
109    130. 80.128. 84.120. 80.118. 80.118. 84. 72. 72. 68. 74. 62.   96.57  98.57  93.24  92.57  95.24  93.60  92.16  81.60
        87.32  73.16  50.00  44.00  40.00  38.00  34.00
110    128. 88.120. 80.120. 84.118. 84.120  84. 75. 74. 71. 73. 75.  101.23  93.24  95.90  95.24  95.90  96.00  88.80  85.20
        86.14  90.00  40.00  40.00  36.00  34.00  36.00
111    130. 88.130. 80.122. 74.120. 76.120. 76. 55. 55. 58. 70. 65.  101.90  96.57  89.91  90.58  90.58  71.50  71.50  70.76
        84.00  78.00  42.00  50.00  48.00  44.00  44.00
112    120. 80.120. 84.118. 84.118. 86.118. 82. 85. 55. 57. 68. 50.   93.24  95.90  95.24  96.57  93.91 102.00  66.00  67.26
        80.24  59.00  40.00  36.00  34.00  32.00  36.00
113    126. 98.126. 90.130. 92.130. 90.132. 92. 77. 73. 70. 68. 65.  107.23 101.90 104.56 103.23 105.23  97.02  91.98  91.00
        88.40  85.80  28.00  36.00  38.00  40.00  40.00
114    130. 80.116. 74.116. 74.116. 76.114. 70. 70. 83. 60. 80. 73.   96.57  87.91  87.91  89.24  84.58  81.00  96.28  69.60
        92.80  83.22  50.00  42.00  42.00  40.00  44.00
115    132. 78.130. 82.132. 80.132. 90.130. 90. 87. 83. 65. 53. 55.   95.90  97.90  97.24 103.90 103.23 114.84 107.90  85.80
        69.96  71.50  54.00  48.00  52.00  42.00  40.00
116    124. 84.124. 86.122. 84.120. 86.122. 76. 62. 52. 50. 57. 48.   97.24  98.57  96.57  97.24  91.24  76.88  64.48  61.00
        68.40  58.56  40.00  38.00  38.00  34.00  46.00
117    120. 64.110. 64.112. 66.110. 68.112. 70. 64. 60. 50. 50. 50.   82.58  79.25  81.25  81.92  83.92  76.80  66.00  56.00
        55.00  56.00  56.00  46.00  46.00  42.00  42.00
118    124. 80.128. 76.128. 74.124. 76.128. 78.115.120.100.120.100.   94.57  93.24  91.91  91.91  94.57 142.60 153.60 128.00
       148.80 128.00  44.00  52.00  54.00  48.00  50.00
119    100. 68.104. 70.100. 68.100. 68.100. 70. 65. 65. 60. 72. 65.   78.59  81.25  78.59  78.59  79.92  65.00  67.60  60.00
        72.00  65.00  32.00  34.00  32.00  32.00  30.00
120    138. 82.132. 84.134. 84.134. 82.130. 82. 55. 50. 55. 55. 55.  100.57  99.90 100.57  99.23  97.90  75.90  66.00  73.70
        73.70  71.50  56.00  48.00  50.00  52.00  48.00
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16. Raw data for isometric rest-hamstrings
    (a) mean blood pressure (V16-V20)
    (b) modified tension time index (V21-V25)
    (c) pulse pressure (V26-V30)

1	120.	84	116.	84	118.	84	130.	86	124.	88	77.	80.	70.	82.	77.	95.90	94.57	95.24	100.57	99.90	92.40	92.80	82.60
	106.60	95.48	36.00	32.00	34.00	44.00	36.00																
2	110.	84	118.	90	112.	90	116.	92	120.	96.	85.	83.	87.	78.	78.	92.57	99.23	97.24	99.90	103.90	93.50	97.94	97.44
	90.48	93.60	26.00	28.00	22.00	24.00	24.00																
3	130.	90	130.	92	128.	90	128.	90	130.	90.	93.	58.	67.	60.	64.	103.23	104.56	102.56	102.56	103.23	120.90	75.40	85.76
	76.80	83.20	40.00	38.00	38.00	38.00	40.00																
4	130.	92	128.	84	130.	90	130.	88	130.	92.	57.	50.	57.	54.	80.	104.56	98.57	103.23	101.90	104.56	74.10	64.00	74.10
	70.20	104.00	38.00	44.00	40.00	42.00	38.00																
5	130.	94	120.	96	118.	92	120.	90	120.	96.	67.	75.	74.	80.	90.	105.89	103.90	100.57	99.90	103.90	87.10	90.00	87.32
	96.00	108.00	36.00	24.00	26.00	30.00	24.00																
6	115.	68	115.	88	118.	70	118.	70	120.	68.	65.	52.	55.	54.	80.	83.58	96.90	85.91	85.91	85.25	74.75	59.80	64.90
	63.72	96.00	47.00	27.00	48.00	48.00	52.00																
7	118.	84	120.	80	120.	84	120.	84	128.	88.	80.	65.	80.	72.	107.	95.24	93.24	95.90	95.90	101.23	94.40	78.00	96.00
	86.40	136.96	34.00	40.00	36.00	36.00	40.00																
8	122.	96	120.	96	130.	100.	130.	100.	130.	104.	57.	57.	73.	57.	80.	104.56	103.90	109.89	109.89	112.55	69.54	68.40	94.90
	74.10	104.00	26.00	24.00	30.00	30.00	26.00																
9	130.	96	128.	96	128.	96	126.	94	126.	98.	65.	67.	62.	60.	65.	107.23	106.56	106.56	104.56	107.23	84.50	85.76	79.36
	75.60	81.90	34.00	32.00	32.00	32.00	28.00																
10	118.	76	116.	76	112.	76	110.	72	110.	74.	53.	62.	58.	53.	73.	89.91	89.24	87.91	84.58	85.91	62.54	71.92	64.96
	58.30	80.30	42.00	40.00	36.00	38.00	36.00																
11	136.	90	132.	90	130.	86	130.	88	132.	90.	52.	60.	55.	50.	70.	105.23	103.90	100.57	101.90	103.90	70.72	79.20	71.50
	65.00	92.40	46.00	42.00	44.00	42.00	42.00																
12	116.	78	110.	80	110.	80	110.	80	110.	82.	52.	51.	58.	57.	65.	90.58	89.91	89.91	89.91	91.24	60.32	56.10	63.80
	62.70	71.50	38.00	30.00	30.00	30.00	28.00																
13	118.	84	118.	84	118.	82	116.	80	114.	84.	65.	65.	63.	63.	74.	95.24	95.24	93.91	91.91	93.91	76.70	76.70	74.34
	73.08	84.36	34.00	34.00	36.00	36.00	30.00																
14	122.	84	120.	86	118.	88	120.	88	122.	88.	67.	73.	67.	65.	82.	96.57	97.24	97.90	98.57	99.23	81.74	87.60	79.06
	78.00	100.04	38.00	34.00	30.00	32.00	34.00																
15	122.	76	122.	76	124.	76	122.	80	124.	76.	60.	60.	77.	58.	78.	91.24	91.24	91.91	93.91	91.91	73.20	73.20	95.48
	70.76	96.72	46.00	46.00	48.00	42.00	48.00																
16	112.	84	112.	84	112.	84	110.	80	112	86.	52.	48.	50.	53.	67.	93.24	93.24	93.24	89.91	94.57	58.24	53.76	56.00
	58.30	75.04	28.00	28.00	28.00	30.00	26.00																
17	122.	90	124.	92	126.	94	124.	96	124.	96.	62.	70.	63.	70.	80.	100.57	102.56	104.56	105.23	105.23	75.64	86.80	79.38
	86.80	99.20	32.00	32.00	32.00	28.00	28.00																
18	110.	76	110.	74	108.	70	110.	70	112.	74.	53.	60.	55.	52.	87.	87.25	85.91	82.58	83.25	86.58	58.30	66.00	59.40
	57.20	97.44	34.00	36.00	38.00	40.00	38.00																
19	120.	96	118.	92	124.	96	124.	96	126.	96.	60.	70.	55.	60.	70.	103.90	100.57	105.23	105.23	105.89	72.00	82.60	68.20
	74.40	88.20	24.00	26.00	28.00	28.00	30.00																
20	118.	80	120.	84	118.	86	118.	86	118.	86.	45.	52.	57.	47.	65.	92.57	95.90	96.57	96.57	96.57	53.10	62.40	67.26
	55.46	76.70	38.00	36.00	32.00	32.00	32.00																
21	104.	68	104.	70	104.	68	104.	66	104.	66.	43.	50.	53.	62.	45.	79.92	81.25	79.92	78.59	78.59	44.72	52.00	55.12
	64.48	46.80	36.00	34.00	36.00	38.00	38.00																
22	112.	78	112.	80	110.	78	112.	80	114.	78.	83.	85.	97.	85.	100.	89.24	90.58	88.58	90.58	89.91	92.96	95.20	106.70
	95.20	114.00	34.00	32.00	32.00	32.00	36.00																
23	106.	70	106.	68	104.	70	104.	70	104.	70.	70.	70.	65.	65.	75.	81.92	80.59	81.25	81.25	81.25	74.20	74.20	67.60
	67.60	78.00	36.00	38.00	34.00	34.00	34.00																
24	120.	80	120.	80	120.	80	124.	84	124.	84.	63.	55.	60.	60.	65.	93.24	93.24	93.24	97.24	97.24	75.60	66.00	72.00
	74.40	80.60	40.00	40.00	40.00	40.00	40.00																
25	128.	90	130.	88	126.	88	120.	88	118.	84.	90.	87.	78.	77.	80.	102.56	101.90	100.57	98.57	95.24	115.20	126.10	98.28
	92.40	94.40	38.00	42.00	38.00	32.00	34.00																
26	115.	90	130.	90	124.	82	120.	84	120.	96.	86.	83.	86.	78.	85.	98.23	103.23	102.56	95.90	103.90	98.90	107.90	106.64
	93.60	102.00	25.00	40.00	32.00	36.00	24.00																
27	120.	90	124.	90	120.	88	122.	90	120.	94.	60.	65.	59.	50.	70.	99.90	101.23	98.57	100.57	102.56	72.00	80.60	70.80
	61.00	84.00	30.00	34.00	32.00	32.00	26.00																
28	130.	88	120.	80	124.	88	126.	90	124.	90.	65.	57.	65.	60.	70.	101.90	93.24	99.90	101.90	101.23	84.50	68.40	80.60
	75.60	86.80	42.00	40.00	36.00	36.00	34.00																
29	124.	92	124.	88	130.	88	122.	90	120.	90.	65.	60.	78.	73.	68.	102.56	99.90	101.90	100.57	99.90	80.60	74.40	101.40
	89.06	81.60	32.00	36.00	42.00	32.00	30.00																
30	150.	90	132.	78	140.	70	140.	70	138.	70.	63.	60.	62.	48.	61.	109.89	95.90	93.24	93.24	92.57	94.50	79.20	86.80

31	67.20	84.18	60.00	54.00	70.00	70.00	68.00	115.	90.	118.	84.	118.	84.	124.	80.	120.	88.	84.	82.	80.	73.	95.	98.23	95.24	95.24	94.57	98.57	96.60	96.76	94.40
32	90.52	114.00	25.00	34.00	34.00	44.00	32.00	142.	96.	138.	96.	138.	96.	138.	100.	140.	96.	75.	65.	68.	63.	80.	111.22	109.89	109.89	112.55	110.56	106.50	89.70	93.84
33	86.94	112.00	46.00	42.00	42.00	38.00	44.00	132.	98.	130.	98.	130.	96.	130.	98.	132.	98.	65.	67.	60.	68.	65.	109.22	108.56	107.23	108.56	109.22	85.80	87.10	78.00
34	88.40	85.80	34.00	32.00	34.00	32.00	34.00	120.	74.	112.	74.	110.	74.	110.	76.	110.	76.	70.	75.	75.	65.	63.	89.24	86.58	85.91	87.25	87.25	84.00	84.00	82.50
35	71.50	69.30	46.00	38.00	36.00	34.00	34.00	140.	88.	130.	80.	130.	84.	128.	84.	128.	84.	60.	60.	70.	67.	86.	105.23	96.57	99.23	98.57	98.57	84.00	78.00	91.00
36	85.76	110.08	52.00	50.00	46.00	44.00	44.00	114.	80.	110.	78.	108.	78.	108.	78.	108.	80.	50.	53.	53.	52.	55.	91.24	88.58	87.91	87.91	89.24	57.00	58.30	57.24
37	56.16	59.40	34.00	32.00	30.00	30.00	28.00	110.	82.	110.	80.	112.	80.	110.	80.	108.	80.	63.	68.	66.	66.	60.	91.24	89.91	90.58	89.91	89.24	69.30	74.80	73.92
38	72.60	64.80	28.00	30.00	32.00	30.00	28.00	112.	80.	112.	80.	112.	84.	110.	84.	110.	84.	67.	68.	72.	75.	87.	90.58	90.58	93.24	92.57	92.57	75.04	76.16	80.64
39	82.50	95.70	32.00	32.00	28.00	26.00	26.00	140.	70.	138.	64.	136.	70.	126.	78.	126.	68.	73.	74.	70.	58.	88.	93.24	88.58	91.91	93.91	87.25	102.20	102.12	95.20
40	73.08	110.88	70.00	74.00	66.00	48.00	58.00	110.	76.	112.	80.	114.	84.	114.	80.	110.	84.	70.	67.	70.	58.	80.	87.25	90.58	93.91	91.24	92.57	77.00	75.04	79.80
41	66.12	88.00	34.00	32.00	30.00	34.00	26.00	134.	90.	132.	92.	130.	94.	132.	94.	134.	96.	65.	77.	66.	70.	72.	104.56	105.23	105.89	106.56	108.56	87.10	101.64	85.80
42	92.40	96.48	44.00	40.00	36.00	38.00	38.00	140.	82.	118.	80.	118.	80.	114.	80.	110.	78.	77.	60.	77.	55.	78.	101.23	92.57	92.57	91.24	88.58	107.80	70.80	90.86
43	62.70	85.80	58.00	38.00	38.00	34.00	32.00	128.	90.	126.	90.	130.	90.	128.	88.	130.	90.	43.	60.	60.	55.	68.	102.56	101.90	103.23	101.23	103.23	55.04	75.60	78.00
44	70.40	88.40	38.00	36.00	40.00	40.00	40.00	142.	70.	128.	76.	120.	80.	120.	88.	118.	80.	48.	46.	55.	47.	75.	93.91	93.24	93.24	98.57	92.57	68.16	58.88	66.00
45	56.40	88.60	72.00	52.00	40.00	32.00	38.00	104.	66.	106.	72.	106.	70.	108.	66.	104.	68.	60.	50.	73.	55.	67.	78.59	83.25	81.92	79.92	79.92	62.40	53.00	77.38
46	59.40	69.68	38.00	34.00	36.00	42.00	36.00	112.	78.	108.	78.	110.	80.	108.	80.	110.	80.	95.	93.	83.	102.	105.	89.24	87.91	89.91	89.24	89.91	106.40	100.44	91.30
47	110.16	115.50	34.00	30.00	30.00	28.00	30.00	104.	64.	104.	64.	104.	68.	106.	68.	106.	68.	66.	65.	64.	65.	68.	77.26	77.26	79.92	80.59	80.59	68.64	67.60	66.56
48	68.90	72.08	40.00	40.00	36.00	38.00	38.00	130.	80.	130.	88.	130.	82.	132.	88.	128.	84.	58.	65.	55.	68.	70.	96.57	101.90	97.90	102.56	98.57	75.40	84.50	71.50
49	89.76	89.60	50.00	42.00	48.00	44.00	44.00	132.	100.	126.	98.	120.	84.	122.	92.	120.	88.	87.	77.	72.	77.	80.	110.56	107.23	95.90	101.90	98.57	114.84	97.02	86.40
50	93.94	96.00	32.00	28.00	36.00	30.00	32.00	118.	84.	124.	90.	120.	92.	112.	88.	110.	96.	93.	82.	90.	80.	80.	95.24	101.23	101.23	95.90	100.57	109.74	101.68	108.00
51	89.60	88.00	34.00	34.00	28.00	24.00	14.00	130.	90.	120.	80.	138.	94.	128.	90.	128.	90.	55.	65.	58.	65.	72.	103.23	93.24	108.56	102.56	102.56	71.50	78.00	80.04
52	83.20	92.16	40.00	40.00	44.00	38.00	38.00	138.	88.	140.	88.	136.	90.	128.	90.	132.	86.	62.	55.	62.	57.	55.	104.56	105.23	105.23	102.56	101.23	85.56	77.00	84.32
53	72.96	72.60	50.00	52.00	46.00	38.00	46.00	132.	98.	120.	94.	120.	88.	118.	90.	120.	90.	80.	75.	75.	90.	62.	109.22	102.56	98.57	99.23	99.90	105.60	90.00	90.00
54	106.20	74.40	34.00	26.00	32.00	28.00	30.00	138.	88.	120.	72.	124.	68.	120.	70.	116.	76.	55.	53.	50.	63.	65.	104.56	87.91	86.58	86.58	89.24	76.90	63.60	62.00
55	75.60	75.40	50.00	48.00	56.00	50.00	40.00	120.	96.	120.	94.	118.	86.	120.	80.	122.	84.	73.	83.	78.	80.	74.	103.90	102.56	96.57	93.24	96.57	87.60	99.60	92.04
56	96.00	90.28	24.00	26.00	32.00	40.00	38.00	140.	96.	138.	90.	142.	96.	138.	96.	138.	92.	61.	58.	62.	55.	58.	110.56	105.89	111.22	109.89	107.23	85.40	80.04	88.04
57	75.90	80.04	44.00	48.00	46.00	42.00	46.00	132.	98.	138.	90.	134.	100.	136.	94.	136.	94.	65.	73.	63.	60.	73.	109.22	105.89	111.22	107.89	107.89	85.80	100.74	84.42
58	81.60	99.28	34.00	48.00	34.00	42.00	42.00	110.	70.	110.	76.	110.	80.	110.	78.	110.	70.	60.	60.	55.	60.	72.	83.25	87.25	89.91	88.58	83.25	66.00	66.00	60.50
59	66.00	79.20	40.00	34.00	30.00	32.00	40.00	138.	76.	136.	84.	130.	80.	132.	76.	132.	76.	55.	50.	55.	55.	87.	96.57	101.23	96.57	94.57	94.57	75.90	68.00	71.50
60	72.60	114.84	62.00	52.00	50.00	56.00	56.00	118.	78.	[illegible]	82.	112.	80.	110.	80.	110.	80.	65.	68.	55.	68.	68.	91.24	93.24	90.58	89.91	89.91	76.70	78.88	61.60

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        74.80  74.80  40.00  34.00  32.00  30.00  30.00
61     120. 78.114. 84.114. 80.112. 80.110. 80. 67. 68. 68. 74 68  91.91  93.91  91.24  90.58  89.91  80 40  77.52  77.52
        82.88  74.80  42.00  30.00  34.00  32.00  30.00
62     124. 82.122. 88.120. 84.118. 86.122. 88. 74. 70. 75. 78. 75.  95.90  99.23  95.90  96.57  99.23  91.76  85.40  90.00
        92.04  91.50  42.00  34.00  36.00  32.00  34.00
63     140. 72.136. 72.136. 72.124. 70.132. 70. 65. 57. 59. 68. 78.  94.57  93.24  93.24  87.91  90.58  91.00  77.52  80.24
        84.32 102 96  68.00  64.00  64.00  54.00  62.00
64     124. 86.124. 80.120. 78.118. 80.120. 78. 50. 58. 51. 54. 55.  98.57  94.57  91.91  92.57  91.91  62.00  71.92  61.20
        63.72  66.00  38.00  44.00  42.00  38.00  42.00
65     140. 96.132. 96.130.100.130.100.132.100. 70. 69. 70. 67. 70. 110.56 107.89 109.89 109.89 110.56  98.00  91.08  91.00
        87.10  92.40  44.00  36.00  30.00  30.00  32.00
66     140. 74.120. 76.116. 76.118. 74.118. 80. 68. 73. 68. 80. 64.  95.90  90.58  89.24  88.58  92.57  95.20  87.60  78.88
        94.40  75.52  66.00  44.00  40.00  44.00  38.00
67     148. 90.140. 86.136. 88.132. 88.132. 86. 58. 56. 53. 60. 53. 109.22 103.90 103.90 102.56 101.23  85.84  78.40  72.08
        79.20  69.96  58.00  54.00  48.00  44.00  46.00
68     124. 76.122. 88.120. 84.118. 84.118. 86. 65. 57. 50. 58. 63.  91.91  99.23  95.90  95.24  96.57  80.60  69.54  60.00
        68.44  74.34  48.00  34.00  36.00  34.00  32.00
69     120. 58.110. 66.110. 68.110. 60.112. 66. 60. 65. 58. 56. 48.  78.59  80.59  81.92  76.59  81.25  72.00  71.50  63.80
        61.60  53.76  62.00  44.00  42.00  50.00  46.00
70     118. 74.122. 76.118. 76.118. 70.112. 68. 97.107. 80. 87. 95.  88.58  91.24  89.91  85.91  82.58 114.46 130.54  94.40
       102.66 106.40  44.00  46.00  42.00  48.00  44.00
71     108. 70.104. 70.104. 68.104. 70.104. 68. 65. 65. 60. 68. 65.  82.58  81.25  79.92  81.25  79.92  70.20  67.60  62.40
        70.72  67.60  38.00  34.00  36.00  34.00  36.00
72     140. 86.146. 82.132. 80.134. 78.136. 82. 57. 50. 58. 52. 75. 103.90 103.23  97.24  96.57  99.90  79.80  73.00  76.56
        69.68 102.00  54.00  64.00  52.00  56.00  54.00
73     126.108.120. 90.120. 88.122. 96.120. 92. 82. 74. 80. 77. 82. 113.89  99.90  98.57 104.56 101.23 103.32  88 80  96.00
        93.94  98.40  18.00  30.00  32.00  26.00  28.00
74     110. 90.110. 88.112. 92.108. 90.112. 90. 83. 82. 83. 92. 88.  96.57  95.24  98.57  95.90  97.24  91.30  90.20  92.96
        99.36  98.56  20.00  22.00  20.00  18.00  22.00
75     130. 88.120. 90.126. 88.120. 88.120. 90. 87. 52. 56. 46. 85. 101.90  99.90 100.57  98.57  99.90 113.10  62.40  70.56
        55.20 102.00  42.00  30.00  38.00  32.00  30.00
76     130. 94.130. 90.128. 88.130. 88.128. 90. 58. 57. 60. 55. 55. 105.89 103.23 101.23 101.90 102.56  75.40  74.10  76.80
        71.50  70.40  36.00  40.00  40.00  42.00  38.00
77     130. 90.120. 92.120. 90.118. 88.122. 88. 78. 73. 80. 75. 75. 103.23 101.23  99.90  97.90  99.23 101.40  87.60  96.00
        88.50  91.50  40.00  28.00  30.00  30.00  34.00
78     128. 76.110. 78.118. 80.120. 76.112. 84. 55. 53. 53. 52. 59.  93.24  88.58  92.57  90.58  93.24  70.40  58.30  62.54
        62.40  66.08  52.00  32.00  38.00  44.00  28.00
79     118. 88.118. 80.118. 90.118. 86.120. 78. 93. 64. 78. 70. 77.  97.90  92.57  99.23  96.57  91.91 109.74  75.52  92.04
        82.60  92.40  30.00  38.00  28.00  32.00  42.00
80     148.104.138.100.138. 98.140. 92.140.100. 67. 58. 58. 58. 70. 118.55 112.55 111.22 107.69 113.22  99.16  80.04  80.04
        81.20  98.00  44.00  38.00  40.00  48.00  40.00
81     132.100.130. 96.130. 96.128. 98.130. 98. 67. 66. 73. 65. 65. 110.56 107.23 107.23 107.89 108.56  88.44  85.80  94.90
        83.20  84.50  32.00  34.00  34.00  30.00  32.00
82     112. 84.110. 76.112. 80.110. 80.110. 80. 66. 67. 57. 72. 68.  93.24  87.25  90.58  89.91  89.91  73.92  73.70  63 84
        79.20  74.80  28.00  34.00  32.00  30.00  30.00
83     140. 84.140  80.140. 78.132. 78.134. 80. 53. 52. 53. 54. 58. 102.56  99.90  98.57  95.90  97.90  74.20  72.80  74 20
        71.28  77.72  56.00  60.00  62.00  54.00  54.00
84     118. 80.120. 82.118. 84.118. 80.118. 84. 62. 62. 53. 54. 57.  92.57  94.57  95.24  92.57  95.24  73.16  74.40  62.54
        63.72  67.26  38.00  38.00  34.00  38.00  34.00
85     124. 86.120. 86.118. 84.114. 84.112. 84. 77. 60. 65. 68. 68.  98.57  97.24  95.24  93.91  93.24  95.48  72.00  76.70
        77.52  76.16  38.00  34.00  34.00  30.00  28.00
86     118. 88.118. 92.118. 90.118. 88.118. 90. 67. 62. 62. 67. 68.  97.90 100.57  99.23  97.90  99.23  79.06  73.16  73.16
        79.06  80.24  30.00  26.00  28.00  30.00  28.00
87     136. 78.120. 78.120. 78.126. 76.120. 72. 84. 52. 70. 65. 80.  97.24  91.91  91.91  92.57  87.91 114.24  62.40  84.00
        81.90  96.00  58.00  42.00  42.00  50.00  48.00
88     112. 76.110. 76.112. 80.112. 80.112. 80. 47. 51. 52. 58. 60.  87.91  87.25  90.58  90.58  90.58  52.64  56.10  58.24
        64.96  67.20  36.00  34.00  32.00  32.00  32.00
89     132.100.124.100.122.100.126.100.130.100. 70. 78. 75. 77. 68. 110.56 107.89 107.23 108.56 109.89  92.40  96.72  91.50
        97.02  88.40  32.00  24.00  22.00  26.00  30.00
90     118. 80.118. 80.120. 76.114. 78.118. 78. 63. 56. 60. 57. 60.  92.57  92.57  90.58  89.91  91.24  74.34  66.08  72.00
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	64.98 70.80 38.00 38.00 44.00 36.00 40.00
91	130. 90.130. 88.130. 88.130. 90.130. 90. 53. 55. 55. 55. 48. 103.23 101.90 101.90 103.23 103.23 68.90 71.50 71.50
	71.50 62.40 40.00 42.00 42.00 40.00 40.00
92	118. 70.118. 76.118. 78.112. 80.112. 80. 83. 55. 55. 56. 57. 85.91 89.91 91.24 90.58 90.58 97.94 64.90 64.90
	62.72 63.84 48.00 42.00 40.00 32.00 32.00
93	122. 56.120. 70.115. 68.115. 70.110. 68. 63. 48. 60. 55. 70. 77.92 86.58 83.58 84.91 81.92 76.86 57.60 69.00
	63.25 77.00 66.00 50.00 47.00 45.00 42.00
94	112. 76.112. 74.110. 74.110. 76.110. 76. 89. 93. 90. 95. 93. 87.91 86.58 85.91 87.25 87.25 99.68 104.16 99.00
	104.50 102.30 36.00 38.00 36.00 34.00 34.00
95	110. 68.112. 64.112. 68.104. 76.108. 74. 65. 70. 72. 63. 70. 81.92 79.92 82.58 85.25 85.25 71.50 78.40 80.64
	65.52 75.60 42.00 48.00 44.00 28.00 34.00
96	140. 80.138. 80.132. 80.136. 82.132. 86. 53. 67. 53. 55. 53. 99.90 99.23 97.24 99.90 101.23 74.20 92.46 89.96
	74.80 69.96 60.00 58.00 52.00 54.00 46.00
97	120. 94.116. 90.120. 90.118. 88.116. 96. 77. 90. 77. 64. 80. 102.56 98.57 99.90 97.90 102.56 92.40 104.40 92.40
	75.52 92.80 26.00 26.00 30.00 30.00 20.00
98	116. 84.112. 80.104. 88.116. 84.112. 84. 80. 78. 85. 75. 76. 94.57 90.58 93.24 94.57 93.24 92.80 87.36 88.40
	87.00 85.12 32.00 32.00 16.00 32.00 28.00
99	130. 90.128. 88.120. 90.120. 84.120. 88. 68. 64. 74. 65. 64. 103.23 101.23 99.90 95.90 98.57 88.40 81.92 88.80
	78.00 76.80 40.00 40.00 30.00 36.00 32.00
100	138. 90.128. 92.126. 86.130. 90.130. 92. 57. 60. 57. 62. 53. 105.89 103.90 99.23 103.23 104.56 78.66 76.80 71.82
	80.60 68.90 48.00 36.00 40.00 40.00 38.00
101	118. 90.110. 88.118. 82.116. 88.110. 82. 82. 80. 80. 75. 82. 99.23 95.24 93.91 97.24 91.24 96.76 88.00 94.40
	87.00 90.20 28.00 22.00 36.00 28.00 28.00
102	118. 80.110. 76.120. 76.116. 76.118. 80. 50. 57. 53. 50. 50. 92.57 87.25 90.58 89.24 92.57 59.00 62.70 63.60
	58.00 59.00 38.00 34.00 44.00 40.00 38.00
103	128. 80.128. 80.128. 84.124. 80.124. 80. 88. 78. 78. 67. 73. 95.90 95.90 98.57 94.57 94.57 112.64 99.84 99.84
	83.08 90.52 48.00 48.00 44.00 44.00 44.00
104	144. 98.140.100.140. 98.140.110.140. 94. 65. 60. 62. 63. 55. 113.22 113.22 111.89 119.88 109.22 93.60 84.00 86.80
	88.20 77.00 46.00 40.00 42.00 30.00 46.00
105	128. 98.132. 96.132. 98.130. 96.130. 98. 73. 65. 68. 65. 63. 107.89 107.89 109.22 107.23 108.56 93.44 85.80 89.76
	84.50 81.90 30.00 36.00 34.00 34.00 32.00
106	108. 84.108. 78.108. 76.102. 70.108. 70. 70. 55. 60. 57. 57. 91.91 87.91 86.58 80.59 82.58 75.60 59.40 64.80
	58.14 61.56 24.00 30.00 32.00 32.00 38.00
107	140. 84.142. 84.140. 82.130. 80.130. 80. 66. 68. 65. 65. 65. 102.56 103.23 101.23 96.57 96.57 92.40 96.56 91.00
	84.50 84.50 56.00 58.00 58.00 50.00 50.00
108	112. 70.110. 78.108. 82.108. 80.108. 80. 60. 55. 59. 56. 65. 83.92 88.58 90.58 89.24 89.24 67.20 60.50 63.72
	60.48 70.20 42.00 32.00 26.00 28.00 28.00
109	118. 86.116. 86.116. 84.116. 82.114. 82. 70. 70. 70. 63. 78. 96.57 95.90 94.57 93.24 92.57 82.60 81.20 81.20
	73.08 88.92 32.00 30.00 32.00 34.00 32.00
110	124. 84.120. 90.120. 90.118. 92.118. 88. 72. 68. 70. 69. 68. 97.24 99.90 99.90 100.57 97.90 89.28 81.60 84.00
	81.42 80.24 40.00 30.00 30.00 26.00 30.00
111	124. 80.112. 80.112. 76.116. 78.112. 76. 72. 60. 78. 60. 80. 94.57 90.58 87.91 90.58 87.91 89.28 67.20 87.36
	69.60 89.60 44.00 32.00 36.00 38.00 36.00
112	122. 80.120. 80.120. 82.116. 80.112. 78. 50. 53. 52. 55. 55. 93.91 93.24 94.57 91.91 89.24 69.00 63.60 62.40
	63.80 61.60 42.00 40.00 38.00 36.00 34.00
113	138. 92.138.100.136. 98.132. 94.132. 90. 65. 67. 65. 72. 68. 107.23 112.55 110.56 106.56 103.90 89.70 92.46 88.40
	95.04 89.76 46.00 38.00 38.00 38.00 42.00
114	114. 74.116. 74.118. 76.114. 76.114. 76. 60. 70. 73. 62. 63. 87.25 87.91 89.91 88.58 88.58 68.40 81.20 86.14
	70.68 74.10 40.00 42.00 42.00 38.00 38.00
115	138. 80.138. 90.130. 92.128. 92.132. 92. 70. 75. 75. 80. 70. 99.23 105.89 104.56 103.90 105.23 96.60 103.50 97.50
	102.40 92.40 58.00 48.00 38.00 36.00 40.00
116	120. 84.116. 80.118. 82.118. 80.114. 82. 53. 67. 42. 66. 55. 95.90 91.91 93.91 92.57 92.57 63.60 77.72 49.56
	77.88 62.70 36.00 36.00 36.00 38.00 32.00
117	122. 68.108. 72.102. 68.104. 66.104. 68. 53. 50. 75. 52. 55. 85.91 83.92 79.25 78.59 79.92 64.66 54.00 76.50
	54.08 57.20 54.00 36.00 34.00 38.00 36.00
118	138. 74.128. 76.120. 74.114. 72.108. 76.115. 95.103. [illegible]3.100. 95.24 93.24 89.24 85.91 86.58 158.70 121.60 123.60
	106.02 108.00 64.00 52.00 46.00 42.00 32.00
119	100. 70.104. 76.104. 72.102. 68.104. 70. 67. 63. 67. 65. 65. 79.92 85.25 82.58 79.25 81.25 67.00 65.52 69.68
	66.30 67.60 30.00 28.00 32.00 34.00 34.00
120	134 70.132. 88.132. 80.130. 78.130. 82. 55. 65. 53. 63. 55. 81.24 102.56 97.24 95.24 97.90 73.70 85.80 69.86
	81.90 71.50 64.00 44.00 52.00 52.00 48.00

17. Raw data for isometric exercise-quadriceps
    (a) mean blood pressure (V13-V16)
    (b) modified tension time index (V17-V20)
    (c) pulse pressure (V21-V24)

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 1   140 110.130.100.120  88.136.100.110. 87. 78. 90. 119.88 109.89  98.57 111.89 154.00 113.10  93.60 122.40  30.00  30.
     00  32.00  36.00
 2   134.110.140.100.152.110.128.100.132.130.110. 90. 117.88 113.22 123.88 109.22 176.88 182.00 167.20 115.20  24.00  40.
     00  42.00  28.00
 3   168.110.150.110.158.124.148. 96. 80. 75. 75. 66. 129.20 123.21 135.20 113.22 134.40 112.50 118.50  97.68  58.00  40.
     00  34.00  52.00
 4   180.138.190.120.160.110.142. 96.107.120. 62. 58. 151.85 143.19 126.54 111.22 192.60 228.00  99.20  82.36  42.00  70.
     00  50.00  46.00
 5   160.110.160.120.142.110.130. 96.113.123. 95. 70. 126.54 133.20 120.55 107.23 180.80 196.80 134.90  91.00  50.00  40.
     00  32.00  34.00
 6   184.110.182.108.148. 88.140. 80.140. 96. 72. 60. 134.53 132.53 107.89  99.90 257.60 174.72 106.56  84.00  74.00  74.
     00  60.00  60.00
 7   150.110.155.128.142.100.144. 90.150.133. 92. 90. 123.21 136.86 113.89 107.89 225.00 206.15 130.64 129.60  40.00  27.
     00  42.00  54.00
 8   170.130.170.115.158.120.146. 98.101.117. 80. 60. 143.19 133.20 132.53 113.89 171.70 198.90 126.40  87.60  40.00  55.
     00  38.00  48.00
 9   162 120.150.115.150.100.136.108.112.112. 87. 72. 133.87 126.54 116.55 117.22 181.44 168.00 130.50  97.92  42.00  35.
     00  50.00  28.00
10   150.118.160.106.122.100.116. 74. 95. 93. 78. 60. 128.54 123.88 107.23  87.91 142.50 148.80  96.38  69.60  32.00  54.
     00  22.00  42.00
11   190.130.192 124.160.110.140. 84.132.122. 85. 65. 149.85 146.52 126.54 102.56 250.80 234.24 136.00  91.00  60.00  68.
     00  50.00  56.00
12   150. 98.148.110.128. 88.120. 84.108.100. 87. 58. 115.22 122.54 101.23  95.90 162.00 148.00 111.36  69.60  52.00  38.
     00  40.00  36.00
13   150. 94.142.100.144. 92.128. 86.115.122. 98. 73. 112.55 113.89 109.22  99.90 172.50 173.24 141.12  93.44  56.00  42.
     00  52.00  42.00
14   152.104.142.104.136. 90.122. 90.113. 87. 72. 66. 119.88 116.55 105.23 100.57 171.76 123.54  97.92  80.52  48.00  38.
     00  46.00  32.00
15   160.110.166.116.140. 96.134. 84.133.138. 93. 74. 126.54 132.53 110.56 100.57 212.80 229.08 130.20  99.16  50.00  50.
     00  44.00  50.00
16   160.124.148.114.130. 90.120. 90.117.118. 82. 75. 135.86 125.21 103.23  99.90 187.20 174.64 106.60  90.00  36.00  34.
     00  40.00  30.00
17   154.120.160.120.140.104.130. 96. 90.104. 76. 65. 131.20 133.20 115.88 107.23 138.60 166.40 106.40  84.50  34.00  40
     00  36.00  34.00
18   160.120.160.122.136.104.124. 90.160.145.102. 85. 133.20 134.53 114.55 101.23 256.00 232.00 138.72 105.40  40.00  38.
     00  32.00  34.00
19   172.124.115.108.148. 90.130. 94.125.105. 65. 56. 139.86 110.22 109.22 105.89 215.00 120.75  96.20  72.80  48.00   7.
     00  58.00  36.00
20   210.140.178.110.140.110.130. 84.115.125. 80. 47. 163.17 132.53 119.88  99.23 241.50 222.50 112.00  61.10  70.00  68.
     00  30.00  46.00
21   150.116.150 118.124. 90.118. 72.133.128. 95. 52. 127.21 128.54 101.23  87.25 199.50 192.00 117.80  61.36  34.00  32
     00  34.00  46.00
22   152. 90.143. 92.134.102.130. 92.174.181.110.106. 110.56 108.89 112.55 104.56 264.48 258.83 147.40 137.80  62.00  51.
     00  32.00  38.00
23   132.100.132. 90.120. 78.108. 76. 90. 95. 85. 63. 110.56 103.90  91.91  86.58 118.80 125.40 102.00  68.04  32.00  42.
     00  42.00  32.00
24   172.130.164.115.136. 90.136. 86.140.100. 80. 60  143.86 131.20 105.23 102.56 240.80 164.00 108.80  81.60  42.00  49.
     00  46.00  50.00
```

18. Raw data for isometric exercise-hamstrings
    (a) mean blood pressure (V13-V16)
    (b) modified tension time index (V17-V20)
    (c) pulse pressure (V21-V24)

1	140.110.142.110.138. 98.132. 96. 100. 96. 85. 85. 119.88 120.55 111.22 107.89 140.00 136.32 117.30 112.20 30.00 32.
	00 40.00 36.00
2	148.120.120. 96.128. 84.112. 88.124. 95. 85. 87. 129.20 103.90 98.57 95.90 183.52 114.00 108.80 97.44 28.00 24
	00 44.00 24.00
3	162.112.170.120.140. 96.126. 90. 82. 63. 70. 73. 128.54 136.53 110.56 101.90 132.84 107.10 98.00 91.98 50.00 50.
	00 44.00 36.00
4	170.138.160.130.144. 92.130. 90.108.105. 58. 55. 148.52 139.86 109.22 103.23 183.60 168.00 83.52 71.50 32.00 30.
	00 52.00 40.00
5	150.120.122.100.128. 86.120. 90.135. 98. 80. 76. 129.87 107.23 106.56 89.90 202.50 119.56 102.40 91.20 30.00 22.
	00 32.00 30.00
6	180.110.155. 96.140. 84.125. 80.135. 76. 65. 62. 133.20 115.55 102.56 84.90 243.00 117.80 91.00 77.50 70.00 59.
	00 56.00 45.00
7	140.115.155.110.144.100.128 92.150.147. 88. 78. 123.21 124.87 114.55 103.90 210.00 227.85 126.72 89.84 25.00 45.
	00 44.00 36.00
8	180.118.150.110.150. 98.142. 96.115. 89. 70. 63. 138.53 123.21 115.22 111.22 207.00 133.50 105.00 89.46 62.00 40.
	00 52.00 46.00
9	155.112.160.112.136.102.132 96.105.105. 73. 65. 126.21 127.87 113.22 107.89 162.75 168.00 99.28 85.80 43.00 48.
	00 34.00 36.00
10	142. 92.140.110.122. 84.110. 84. 98. 87. 67. 60. 108.56 119.88 96.57 92.57 139.16 121.80 81.74 66.00 50.00 30.
	00 38.00 26.00
11	168.110.160.118.150. 90.136. 84.108.122. 78. 58. 129.20 131.87 109.89 101.23 181.44 195.20 117.00 78.88 58.00 42.
	00 60.00 52.00
12	148.114.132. 90.126. 72.120. 78.124. 92. 75. 72. 125.21 103.90 89.91 91.91 183.52 121.44 94.50 86.40 34.00 42
	00 54.00 42.00
13	168.120.128. 92.128. 84.120. 88. 93. 93. 80. 70. 135.86 103.90 98.57 98.57 156.24 119.04 102.40 84.00 48.00 36.
	00 44.00 32.00
14	148.102.126.106.122. 88.118. 86. 87. 87. 77. 76. 117.22 112.55 99.23 96.57 128.76 109.62 93.94 89.68 46.00 20.
	00 34.00 32.00
15	190.138.168.130.138. 88.122 82.150.138. 86. 81. 155.18 142.52 104.56 95.24 285.00 231.84 118.68 98.82 52.00 38.
	00 50.00 40.00
16	156.130.150.110.128. 90.118. 84.124.125. 65. 55. 138.53 123.21 102.56 95.24 193.44 187.50 83.20 64.90 26.00 40
	00 38.00 34.00
17	160.128.140.100.142. 98.136. 98. 80. 78. 66. 73. 138.53 113.22 112.55 110.56 128.00 109.20 93.72 99.28 32.00 40.
	00 44.00 38.00
18	170. 92.142. 98.124. 80.118. 72.130.110. 67. 60. 117.88 112.55 94.57 87.25 221.00 156.20 83.08 70.80 78.00 44.
	00 44.00 46.00
19	170.122.142.100.140. 88.130. 90.125. 85. 50. 43. 137.86 113.89 105.23 103.23 212.50 120.70 70.00 55.90 48.00 42.
	00 52.00 40.00
20	152.120.155.130.138. 94.118. 84.103.100. 63. 63. 130.54 138.19 108.56 95.24 156.56 155.00 86.94 74.34 32.00 25.
	00 44.00 34.00
21	178.110.152.108.130. 80.110. 68.117.118. 78. 55. 132.53 122.54 96.57 81.92 208.26 179.36 101.40 60.50 68.00 44.
	00 50.00 42.00
22	150.100.136. 96.118. 80.112. 78.155.145.100. 94. 118.55 109.22 92.57 89.24 232.50 197.20 118.00 105.28 50.00 40.
	00 38.00 34.00
23	142.110.124. 84.112. 70.108. 74. 94. 82. 66. 62. 120.55 97.24 83.92 85.25 133.48 101.68 73.92 66.96 32.00 40.
	00 42.00 34.00
24	170.130.152.110.150. 96.140. 88.116.103. 82. 63. 143.19 123.88 113.89 105.23 197.20 156.56 123.00 88.20 40.00 42.
	00 54.00 52.00

19. Raw data for comparison of isokinetic and isometric exercise-heart rate

1	104	61	125
2	145	62	140
3	132	63	137
4	130	64	150
5	137	65	155
6	110	66	183
7	115	67	133
8	113	68	115
9	135	69	147
10	118	70	177
11	120	71	158
12	135	72	186
13	90	73	110
14	108	74	132
15	136	75	80
16	140	76	107
17	135	77	113
18	162	78	140
19	125	79	150
20	100	80	101
21	143	81	112
22	165	82	95
23	130	83	132
24	163	84	108
25	115	85	115
26	153	86	113
27	140	87	133
28	135	88	117
29	140	89	90
30	137	90	160
31	115	91	125
32	150	92	115
33	132	93	133
34	128	94	174
35	134	95	90
36	116	96	140
37	130	97	100
38	142	98	124
39	145	99	82
40	143	100	108
41	138	101	135
42	193	102	135
43	123	103	150
44	125	104	115
45	150	105	105
46	175	106	98
47	165	107	108
48	180	108	124
49	112	109	93
50	153	110	87
51	138	111	150
52	120	112	124
53	150	113	80
54	130	114	130
55	135	115	125
56	135	116	103
57	127	117	117
58	135	118	155
59	142	119	94
60	144	120	116

20. Raw data for comparison of isokinetic and isometric exercise-systolic blood pressure

1	210
2	164
3	210
4	198
5	160
6	170
7	190
8	160
9	150
10	198
11	188
12	190
13	168
14	164
15	192
16	205
17	188
18	160
19	148
20	140
21	170
22	162
23	162
24	140
25	180
26	180
27	180
28	190
29	180
30	190
31	170
32	170
33	170
34	156
35	180
36	168
37	158
38	150
39	192
40	170
41	199
42	158
43	146
44	142
45	182
46	140
47	196
48	155
49	150
50	170
51	210
52	190
53	170
54	180
55	180
56	180
57	170
58	152
59	168
60	160
61	160
62	168
63	176
64	170
65	192
66	144
67	158
68	146
69	190
70	170
71	192
72	162
73	140
74	134
75	168
76	180
77	160
78	184
79	150
80	170
81	162
82	150
83	190
84	150
85	150
86	152
87	160
88	160
89	154
90	160
91	172
92	210
93	150
94	152
95	132
96	172
97	140
98	148
99	162
100	170
101	150
102	180
103	140
104	180
105	155
106	142
107	168
108	148
109	168
110	148
111	190
112	156
113	160
114	170
115	170
116	152
117	178
118	150
119	142
120	170

21. Raw data for comparison of isokinetic and isometric exercise - diastolic blood pressure

1	66	61	38
2	54	62	55
3	68	63	20
4	10	64	60
5	48	65	40
6	60	66	40
7	60	67	35
8	64	68	58
9	68	69	24
10	56	70	10
11	58	71	15
12	50	72	10
13	54	73	110
14	70	74	110
15	20	75	110
16	72	76	138
17	54	77	110
18	54	78	110
19	40	79	110
20	52	80	130
21	15	81	120
22	40	82	118
23	55	83	130
24	25	84	98
25	56	85	94
26	58	86	104
27	76	87	110
28	25	88	124
29	62	89	120
30	68	90	120
31	50	91	124
32	68	92	140
33	62	93	116
34	64	94	90
35	45	95	100
36	72	96	130
37	25	97	110
38	48	98	120
39	20	99	112
40	50	100	138
41	55	101	120
42	25	102	110
43	45	103	115
44	50	104	118
45	20	105	112
46	30	106	92
47	5	107	110
48	10	108	114
49	60	109	120
50	72	110	102
51	55	111	138
52	30	112	130
53	45	113	128
54	60	114	92
55	44	115	122
56	62	116	120
57	76	117	110
58	68	118	100
59	48	119	110
60	38	120	130

22. Raw data for comparison of isokinetic and isometric exercise - mean blood pressure

1	113.89	61	78.59
2	90.58	62	92.57
3	115.22	63	71.93
4	72.59	64	96.57
5	85.25	65	90.58
6	96.57	66	74.59
7	103.23	67	75.92
8	95.90	68	87.25
9	95.24	69	79.25
10	103.23	70	63.27
11	101.23	71	73.93
12	96.57	72	60.61
13	91.91	73	119.88
14	101.23	74	117.88
15	77.26	75	129.20
16	116.22	76	151.85
17	98.57	77	126.54
18	89.24	78	134.53
19	75.92	79	123.21
20	81.25	80	143.19
21	66.60	81	133.87
22	80.59	82	128.54
23	90.58	83	149.85
24	63.27	84	115.22
25	97.24	85	112.55
26	98.57	86	119.88
27	110.56	87	126.54
28	79.92	88	135.86
29	101.23	89	131.20
30	108.56	90	133.20
31	89.91	91	139.86
32	101.90	92	163.17
33	97.90	93	127.21
34	94.57	94	110.56
35	89.91	95	110.56
36	103.90	96	143.86
37	69.26	97	119.88
38	81.92	98	129.20
39	77.26	99	128.54
40	89.91	100	148.52
[illegible]	102.90	101	129.87
	69.26	102	133.20
[illegible]	78.59	103	123.21
4	80.59	104	138.53
5	73.93	105	126.21
6	66.60	106	108.56
47	68.60	107	129.20
48	58.27	108	125.21
49	89.91	109	135.86
50	104.56	110	117.22
51	106.56	111	155.18
52	83.25	112	138.53
53	86.58	113	138.53
54	99.90	114	117.88
55	89.24	115	137.86
56	101.23	116	130.54
57	107.23	117	132.53
58	95.90	118	116.55
59	87.91	119	120.55
60	78.59	120	143.19

23. Raw data for comparison of isokinetic and isometric exercise - modified tension time index

1	218.40	61	200.00
2	237.80	62	235.20
3	277.20	63	241.10
4	257.40	64	255.00
5	219.20	65	297.60
6	187.00	66	263.50
7	218.50	67	210.10
8	180.80	68	167.90
9	202.50	69	279.30
10	233.60	70	300.90
11	225.60	71	303.30
12	256.50	72	301.30
13	151.20	73	154.00
14	177.10	74	176.88
15	261.10	75	134.40
16	287.00	76	192.60
17	253.80	77	180.80
18	259.20	78	257.60
19	185.00	79	225.00
20	140.00	80	171.70
21	243.10	81	181.44
22	267.30	82	142.50
23	210.60	83	250.80
24	228.20	84	162.00
25	207.00	85	172.50
26	275.40	86	171.76
27	252.00	87	212.80
28	256.50	88	187.20
29	252.00	89	138.60
30	260.30	90	256.00
31	195.50	91	215.00
32	255.00	92	241.50
33	224.40	93	199.50
34	199.60	94	264.48
35	241.20	95	118.80
36	194.80	96	240.80
37	205.40	97	140.00
38	213.00	98	183.52
39	278.40	99	132.84
40	243.10	100	183.60
41	274.60	101	202.50
42	304.90	102	243.00
43	179.50	103	210.00
44	177.50	104	207.00
45	273.00	105	162.75
46	245.00	106	139.16
47	323.40	107	181.44
48	279.00	108	183.52
49	168.00	109	156.24
50	260.10	110	128.76
51	289.80	111	285.00
52	228.00	112	193.44
53	255.00	113	128.00
54	234.00	114	221.00
55	243.00	115	212.50
56	243.00	116	156.56
57	215.90	117	208.26
58	205.20	118	232.50
59	238.50	119	133.48
60	230.40	120	197.20

24. Raw data for comparison of isokinetic and isometric exercise - pulse pressure

122.00	144.00
113.00	110.00
156.00	142.00
110.00	188.00
152.00	112.00
104.00	110.00
123.00	130.00
88.00	96.00
166.00	82.00
160.00	142.00
177.00	130.00
152.00	140.00
30.00	114.00
24.00	94.00
58.00	172.00
42.00	133.00
50.00	134.00
74.00	106.00
40.00	108.00
40.00	88.00
42.00	155.00
32.00	122.00
60.00	107.00
52.00	115.00
56.00	124.00
48.00	122.00
50.00	104.00
36.00	165.00
34.00	118.00
40.00	122.00
48.00	120.00
70.00	102.00
34.00	108.00
62.00	92.00
32.00	135.00
42.00	96.00
30.00	133.00
28.00	102.00
50.00	172.00
32.00	120.00
30.00	144.00
70.00	133.00
25.00	101.00
62.00	92.00
43.00	162.00
50.00	110.00
58.00	191.00
34.00	145.00
48.00	90.00
46.00	98.00
52.00	155.00
26.00	160.00
32.00	125.00
78.00	120.00
48.00	136.00
32.00	118.00
68.00	94.00
50.00	84.00
32.00	120.00
40.00	122.00

APPENDIX M

Format Statements

1. Format statement for calculation of isokinetic rest-heart rate

```
RUN NAME        ISOKRESTHR SCORES
FILE NAME       ISOKRESTHR
VARIABLE LIST   VAR1 TO VAR54
INPUT FORMAT    FIXED(2(18F3.0/)(18F3.0))
INPUT MEDIUM    DISK
N OF CASES      24
ANOVAR          WLABELS=SPEED(LOW,MED,HI) BY
               REST(R1,R2,R3,R4,R5,R6) BY
               TRIALS(T1,T2,T3)/
                MEASURES=VAR1 TO VAR54
STATISTICS      ALL
READ INPUT DATA
FINISH
```

2. Format statement for calculation of isokinetic rest-blood pressure

(a) systolic

```
RUN NAME          ISOKRESTBP SCORES
FILE NAME         ISOKRESTBP
VARIABLE LIST     V1 TO V108
INPUT FORMAT      FIXED(5(18F3.0/)(18F3.0))
INPUT MEDIUM      DISK
TASK NAME         SYSTOLIC
ANOVAR            WLABELS=SPEED(LOW,MED,HI) BY
                 REST(1,2,3,4,5,6) BY
                 TRIALS(1,2,3)/
                 MEASURES=V1 V3 V5 V7 V9 V11 V13
                 V15 V17 V19 V21 V23 V25 V27 V29
                 V31 V33 V35 V37 V39 V41 V43 V45
                 V47 V49 V51 V53 V55 V57 V59 V61
                 V63 V65 V67 V69 V71 V73 V75 V77
                 V79 V81 V83 V85 V87 V89 V91 V93
                 V95 V97 V99 V101 V103 V105 V107
STATISTICS        ALL
READ INPUT DATA
FINISH
```

(b) diastolic

```
RUN NAME          ISOKRESTBP SCORES
FILE NAME         ISOKRESTBP
VARIABLE LIST     V1 TO V108
INPUT FORMAT      FIXED(5(18F3.0/)(18F3.0))
INPUT MEDIUM      DISK
TASK NAME         DIASTOLIC
ANOVAR            WLABELS=SPEED(LOW,MED,HI) BY
                 REST(1,2,3,4,5,6) BY
                 TRIALS(1,2,3)/
                 MEASURES= V2 V4 V6 V8 V10 V12 V14 V16
                 V18 V20 V22 V24 V26 V28 V30 V32 V34
                 V36 V38 V40 V42 V44 V46 V48 V50 V52
                 V54 V56 V58 V60 V62 V64 V66 V68 V70
                 V72 V74 V76 V78 V80 V82 V84 V86 V88
                 V90 V92 V94 V96 V98 V100 V102
                 V104 V106 V108
STATISTICS        ALL
READ INPUT DATA
FINISH
```

3. Format statement for calculation of isokinetic exercise-heart rate

```
RUN NAME          ISO SCORES
FILE NAME         ISOKEXHR
VARIABLE LIST     VAR1 TO VAR12
INPUT FORMAT      FIXED(12F3.0)
INPUT MEDIUM      DISK
N OF CASES        24
ANOVAR            WLABELS=SPEED(LOW, MED,HI) BY TRIAL(T1,T2,T3,T4)/
                 MEASURES=VAR1 TO VAR12
OPTIONS           1
STATISTICS        ALL
READ INPUT DATA
FINISH
```

4. Format statement for calculation of isokinetic exercise-blood pressure-systolic and diastolic

```
RUN NAME          ISOKEXBP SCORES
FILE NAME         ISOKEXBP
VARIABLE LIST     V1 TO V24
INPUT FORMAT      FIXED(12(F3.0,F2.0))
INPUT MEDIUM      DISK
TASK NAME         SYSTOLIC
ANOVAR            WLABELS=SPEED(LOW,MED,HI) BY
                 TRIALS(T1,T2,T3,T4)/
                  MEASURES=V1 V3 V5 V7 V9 V11 V13 V15 V17 V19 V21 V23
STATISTICS        ALL
TASK NAME         DIASTOLIC
ANOVAR            WLABELS=SPEED(LOW,MED,HI) BY
                 TRIALS(T1,T2,T3,T4)/
                  MEASURES=V2 V4 V6 V8 V10 V12 V14 V16 V18 V20 V22 V24
STATISTICS        ALL
FINISH
```

5. Format statement for calculation of isometric rest-quadriceps-heart rate

```
RUN NAME          ISOMRESTQDHR SCORES
FILE NAME         ISOMRESTQDHR
VARIABLE LIST     V1 TO V5
INPUT FORMAT      FIXED(5F3.0)
INPUT MEDIUM      DISK
IF                (SEQNUM LE 24) GROUPS=1
IF                (SEQNUM GE 25 AND SEQNUM LE 48) GROUPS=2
IF                (SEQNUM GE 49 AND SEQNUM LE 72) GROUPS=3
IF                (SEQNUM GE 73 AND SEQNUM LE 96) GROUPS=4
IF                (SEQNUM GE 97 AND SEQNUM LE 120) GROUPS=5
TASK NAME         HEART RATE
ANOVAR            BGROUPS=GROUPS(5)/
                  WLABELS=TRIALS(1,2,3,4,5)/
                  MEASURES=V1 TO V5
STATISTICS        ALL
FINISH
```

6. Format statement for calculation of isometric rest-quadriceps-blood pressure

(a) systolic

```
RUN NAME         ISOMRESTQDBP SCORES
FILE NAME        DATAISOMREST
VARIABLE LIST    V1 TO V10
INPUT FORMAT     FIXED(10F3.0)
INPUT MEDIUM     DISK
IF               (SEQNUM LE 24) GROUPS=1
IF               (SEQNUM GE 25 AND SEQNUM LE 48) GROUPS=2
IF               (SEQNUM GE 49 AND SEQNUM LE 72) GROUPS=3
IF               (SEQNUM GE 73 AND SEQNUM LE 96) GROUPS=4
IF               (SEQNUM GE 97 AND SEQNUM LE 120) GROUPS=5
TASK NAME        SYSTOLIC
ANOVAR           BGROUPS=GROUPS(5)/
                WLABELS=TRIALS(1,2,3,4,5)/
                MEASURES=V1 V3 V5 V7 V9
STATISTICS       ALL
FINISH
```

(b) diastolic

```
RUN NAME         ISOMRESTQDBP SCORES
FILE NAME        DATAISOMREST
VARIABLE LIST    V1 TO V10
INPUT FORMAT     FIXED(10F3.0)
INPUT MEDIUM     DISK
IF               (SEQNUM LE 24) GROUPS=1
IF               (SEQNUM GE 25 AND SEQNUM LE 48) GROUPS=2
IF               (SEQNUM GE 49 AND SEQNUM LE 72) GROUPS=3
IF               (SEQNUM GE 73 AND SEQNUM LE 96) GROUPS=4
IF               (SEQNUM GE 97 AND SEQNUM LE 120) GROUPS=5
TASK NAME        DIASTOLIC
ANOVAR           BGROUPS=GROUPS(5)/
                WLABELS=TRIALS(1,2,3,4,5)/
                MEASURES=V2 V4 V6 V8 V10
STATISTICS       ALL
FINISH
```

7. Format statement for calculation of isometric rest-hamstrings-heart rate

```
RUN NAME          ISOMRESTHMHR SCORES
FILE NAME         ISOMRESTHMHR
VARIABLE LIST     V1 TO V5
INPUT FORMAT      FIXED(5F3.0)
INPUT MEDIUM      DISK
IF                (SEQNUM LE 24) GROUPS=1
IF                (SEQNUM GE 25 AND SEQNUM LE 48) GROUPS=2
IF                (SEQNUM GE 49 AND SEQNUM LE 72) GROUPS=3
IF                (SEQNUM GE 73 AND SEQNUM LE 96) GROUPS=4
IF                (SEQNUM GE 97 AND SEQNUM LE 120) GROUPS=5
TASK NAME         HEART RATE
ANOVAR            BGROUPS=GROUPS(5)/
                  WLABELS=TRIALS(1,2,3,4,5)/
                  MEASURES=V1 TO V5
STATISTICS        ALL
FINISH
```

8. Format statement for calculation of isometric rest-hamstrings-blood pressure

(a) <u>systolic</u>

```
RUN NAME          ISOMRESTHMBP SCORES
FILE NAME         ISOMRESTHMBP
VARIABLE LIST      V1 TO V10
INPUT FORMAT      FIXED(10F3.0)
INPUT MEDIUM      DISK
IF                 (SEQNUM LE 24) GROUPS=1
IF                 (SEQNUM GE 25 AND SEQNUM LE 48) GROUPS=2
IF                 (SEQNUM GE 49 AND SEQNUM LE 72) GROUPS=3
IF                 (SEQNUM GE 73 AND SEQNUM LE 96) GROUPS=4
IF                 (SEQNUM GE 97 AND SEQNUM LE 120) GROUPS=5
TASK NAME         SYSTOLIC
ANOVAR            BGROUPS=GROUPS(5)/
                  WLABELS=TRIALS(1,2,3,4,5)/
                  MEASURES=V1 V3 V5 V7 V9
STATISTICS        ALL
FINISH
```

(b) <u>diastolic</u>

```
RUN NAME          ISOMRESTHMBP SCORES
FILE NAME         ISOMRESTHMBP
VARIABLE LIST      V1 TO V10
INPUT FORMAT      FIXED(10F3.0)
INPUT MEDIUM      DISK
IF                (SEQNUM LE 24) GROUPS=1
IF                (SEQNUM GE 25 AND SEQNUM LE 48) GROUPS=2
IF                (SEQNUM GE 49 AND SEQNUM LE 72) GROUPS=3
IF                (SEQNUM GE 73 AND SEQNUM LE 96) GROUPS=4
IF                (SEQNUM GE 97 AND SEQNUM LE 120) GROUPS=5
TASK NAME         DIASTOLIC
ANOVAR            BGROUPS=GROUPS(5)/
                 WLABELS=TRIALS(1,2,3,4,5)/
                 MEASURES=V2 V4 V6 V8 V10
STATISTICS        ALL
FINISH
```

9. Format statement for calculation of isometric exercise-quadriceps-heart rate

```
RUN NAME          ISOMEXQDHR SCORES
FILE NAME         ISOMEXQDHR
VARIABLE LIST     VAR1 TO VAR4
INPUT FORMAT      FIXED(4F3.0)
INPUT MEDIUM      DISK
N OF CASES        24
ANOVAR            WLABELS=TREATMENT(1,2,3,4)/
                 MEASURES=VAR1 TO VAR4
OPTIONS           1
STATISTICS        ALL
READ INPUT DATA
FINISH
```

10. Format statement for calculation of isometric exercise-quadriceps-blood pressure

(a) systolic

```
RUN NAME          ISOMEXQDBP SCORES
FILE NAME         ISOMEXQDBP
VARIABLE LIST     V1 TO V8
INPUT FORMAT      FIXED(8F3.0)
INPUT MEDIUM      DISK
TASK NAME         SYSTOLIC
ANOVAR            WLABELS=REST(1,2,3,4)/
                 MEASURES=V1 V3 V5 V7
STATISTICS        ALL
FINISH
```

(b) diastolic

```
RUN NAME          ISOMEXQDBP SCORES
FILE NAME         ISOMEXQDBP
VARIABLE LIST     V1 TO V8
INPUT FORMAT      FIXED(8F3.0)
INPUT MEDIUM      DISK
TASK NAME         DIASTOLIC
ANOVAR            WLABELS=REST(1,2,3,4)/
                 MEASURES=V2,V4,V6,V8
STATISTICS        ALL
READ INPUT DATA
FINISH
```

11. Format statement for calculation of isometric exercise-hamstrings-heart rate

```
RUN NAME          ISOMEXHMHR SCORES
FILE NAME         ISOMEXHMHR
VARIABLE LIST     VAR1 TO VAR4
INPUT FORMAT      FIXED(4F3.0)
INPUT MEDIUM      DISK
N OF CASES        24
ANOVAR            WLABELS=TREATMENT(1,2,3,4)/
                 MEASURES=VAR1 TO VAR4
OPTIONS           1
STATISTICS        ALL
READ INPUT DATA
FINISH
```

12. Format statement for calculation of isometric exercise-hamstrings-blood pressure

(a) systolic

```
RUN NAME          ISOMEXHMBP SCORES
FILE NAME         ISOMEXHMBP
VARIABLE LIST     V1 TO V8
INPUT FORMAT      FIXED(8F3.0)
INPUT MEDIUM      DISK
TASK NAME         SYSTOLIC
ANOVAR            WLABELS=REST(1,2,3,4)/
                 MEASURES=V1,V3,V5,V7
STATISTICS        ALL
READ INPUT DATA
FINISH
```

(b) diastolic

```
RUN NAME          ISOMEXHMBP SCORES
FILE NAME         ISOMEXHMBP
VARIABLE LIST     V1 TO V8
INPUT FORMAT      FIXED(8F3.0)
INPUT MEDIUM      DISK
TASK NAME         DIASTOLIC
ANOVAR            WLABELS=REST(1,2,3,4)/
                 MEASURES=V2,V4,V6,V8
STATISTICS        ALL
READ INPUT DATA
FINISH
```

13. Format statement for calculation of mean blood pressure, modified tension time index and pulse pressure from raw data

```
R FILE=ISOKEXBP FORMAT=(12(F3.0,F2.0)) VAR=1-24 CASES=1-24 L=*
R FILE=ISOKEXHR FORMAT=12F3.0 VAR=25-36 CASES=1-24 L=*.
TRANS RESULT=101-112 FUNCTION=MULTIPLY VAR=1,3,5,7,9,11,13,15,17,19,21,23:0.333 CASES=ALL L=*
TRANS RESULT=113-124 FUNCTION=MULTIPLY VAR=2,4,6,8,10,12,14,16,18,20,22,24:0.666 L=*
TRANS RESULT=37-48 FUNCTION=ADD VAR=101-112:113-124 L=*
TRANS RESULT=201-212 FUNCTION=MULTIPLY VAR=1,3,5,7,9,11,13,15,17,19,21,23:25-36 CASES=ALL L=*
TRANS RESULT=49-60 FUNCTION=DIVIDE VAR=201-212;100.0 L=*
TRANS RESULT=61-72 FUNCTION=SUBTRACT VAR=1,3,5,7,9,11,13,15,17,19,21,23:2,4,6,8,10,12,14,16,18,20,22,24 L=*
WRITE FILE=-KEX FORMAT=36F4.0,36F7.2 VAR=1-72 CASES=ALL
```

14. Format statement for calculation of mean blood pressure, modified tension time index and pulse pressure form isokinetic rest

```
RUN NAME          ISOKREST SCORES
FILE NAME         ISOKREST
VARIABLE LIST     V1 TO V108
INPUT FORMAT      FIXED(27F4.0,27F7.2/27F4.0,27F7.2)
INPUT MEDIUM      DISK
TASK NAME         MEAN BLOOD PRESSURE ANALYSIS
ANOVAR            WLABELS=TRIALS(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18)/
                 MEASURES=V28 V29 V30 V31 V32 V33 V34 V35 V36 V82 V83 V84 V85 V86 V87 V88 V89
                      V87 V88 V89 V90
STATISTICS        ALL
TASK NAME         MTTI ANALYSIS
ANOVAR            WLABELS=TRIALS(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18)/
                 MEASURES=V37 V38 V39 V40 V41 V42 V43 V44 V45 V91 V92 V93 V94 V95 V96 V97 V98 V99
                      V96 V97 V98 V99
STATISTICS        ALL
TASK NAME         PULSE PRESSURE ANALYSIS
ANOVAR            WLABELS=TRIALS(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18)/
                 MEASURES=V46 V47 V48 V49 V50 V51 V52 V53 V54 V100 V101 V102 V103 V104 V105 V106 V107 V108
                      V104 V105 V106 V107 V108
STATISTICS        ALL
FINISH
```

15. Format statement for calculation of mean blood pressure, modified tension time index and pulse pressure for isokinetic exercise

```
RUN NAME          ISOKEX SCORES
FILE NAME         ISOKEX
VARIABLE LIST     V1 TO V72
INPUT FORMAT      FIXED(36F4.0,36F7.2)
INPUT MEDIUM      DISK
TASK NAME         MEAN BLOOD PRESSURE ANALYSIS
ANOVAR             WLABELS=TRIALS(1,2,3,4,5,6,7,8,9,10,11,12)/
                  MEASURES=V37 V38 V39 V40 V41 V42 V43 V44 V45 V46 V47 V48
STATISTICS        ALL
TASK NAME         MTTI ANALYSIS
ANOVAR            WLABELS=TRIALS(1,2,3,4,5,6,7,8,9,10,11,12)/
                 MEASURES=V49 V50 V51 V52 V53 V54 V55 V56 V57 V58 V59 V60
STATISTICS        ALL
TASK NAME         PULSE PRESSURE ANALYSIS
ANOVAR            WLABELS=TRIALS(1,2,3,4,5,6,7,8,9,10,11,12)/
                 MEASURES=V61 V62 V63 V64 V65 V66 V67 V68 V69 V70 V71 V72
STATISTICS        ALL
FINISH
```

16. Format statement for calculation of mean blood pressure, modified tension time index and pulse pressure for isometric rest-quadriceps and isometric rest-hamstrings

```
RUN NAME          ISOMRESTHM SCORES
FILE NAME         ISOMRESTHM
VARIABLE LIST     V1 TO V30
INPUT FORMAT      FIXED(15F4.0,15F7.2)
INPUT MEDIUM      DISK
TASK NAME         MEAN BLOOD PRESSURE ANALYSIS
ANOVAR            WLABELS=TRIALS(1,2,3,4,5)/
                 MEASURES=V16 V17 V18 V19 V20
STATISTICS        ALL
TASK NAME         MTTI
ANOVAR            WLABELS=TRIALS(1,2,3,4,5)/
                 MEASURES=V21 V22 V23 V24 V25
STATISTICS        ALL
TASK NAME         PULSE PRESSURE ANALYSIS
ANOVAR            WLABELS=TRIALS(1,2,3,4,5)/
                 MEASURES=V26 V27 V28 V29 V30
STATISTICS        ALL
FINISH
```

17. Format statement for calculation of mean blood pressure, modified tension time index and pulse pressure for isometric exercise - quadriceps and isometric exercise-quadriceps

```
RUN NAME          ISOMEXHM SCORES
FILE NAME         ISOMEXHM
VARIABLE LIST     V1 TO V24
INPUT FORMAT      FIXED(12F4.0,12F7.2)
INPUT MEDIUM      DISK
TASK NAME         MEAN BLOOD PRESSURE ANALYSIS
ANOVAR            WLABELS=TRIALS(1,2,3,4)/
                 MEASURES=V13 V14 V15 V16
STATISTICS        ALL
TASK NAME         MTTI
ANOVAR            WLABELS=TRIALS(1,2,3,4)/
                 MEASURES=V17 V18 V19 V20
STATISTICS        ALL
TASK NAME         PULSE PRESSURE ANALYSIS
ANOVAR            WLABELS=TRIALS(1,2,3,4)/
                 MEASURES=V21 V22 V23 V24
STATISTICS        ALL
FINISH
```

18. Format statement for comparison of isokinetic and isometric exercise - heart rate

(a) statement to get raw data combination of maximum isokinetic exercise (first exercise bout) and maximum voluntary contraction in isometric exercise (using * midas)

```
READ FILE=ISOKEXHR FORMAT=3X,I3 VAR=1 LABEL=HEART1 CASES=1-24
READ FILE=ISOKEXHR FORMAT=15X,I3 VAR=1 LABEL=HEART2 CASES=25-48
READ FILE=ISOKEXHR FORMAT=27X,I3 VAR=1 LABEL=HEART3 CASES=49-72
READ FILE=ISOMEXQDHR FORMAT=I3 VAR=1 LABEL=HEART4 CASES=73-96
READ FILE=ISOMEXHMHR FORMAT=I3 VAR=1 LABEL=HEART5 CASES=97-120
WRITE FILE=HEART10 FORMAT=I3 VAR=1 CASES=ALL
FINISH
```

(b) statement to compare isokinetic and isometric exercise by one way analysis of variance (using * spss)

```
RUN NAME        COMHEART
FILE NAME       COMHEART
VARIABLE LIST   V1
INPUT FORMAT    FIXED(F3.0)
INPUT MEDIUM    DISK
SUBFILE LIST    HEART1(24),HEART2(24),HEART3(24),HEART4(24),HEART5(24)
ONEWAY          V1 BY SUBFILES/RANGES=SCHEFFE/
STATISTICS      ALL
FINISH
```

19. Format statement for comparison of isokinetic and isometric exercise - systolic blood pressure

(a) statement to get raw data combination of maximum isokinetic exercise (first exercise bout) and maximum voluntary contraction in isometric exercise (using * midas)

```
READ FILE=ISOKEXBP FORMAT=5X,I3 VAR=1 LABEL=SYSTOLIC1 CASES=1-24
READ FILE=ISOKEXBP FORMAT=25X,I3 VAR=1 LABEL=SYSTOLIC2 CASES=25-48
READ FILE=ISOKEXBP FORMAT=45X,I3 VAR=1 LABEL=SYSTOLIC3 CASES=49-72
READ FILE=ISOMEXQDBP FORMAT=I3 VAR=1 LABEL=SYSTOLIC4 CASES=73-96
READ FILE=ISOMEXHMBP FORMAT=I3 VAR=1 LABEL=SYSTOLIC5 CASES=97-120
WRITE FILE=SYSTOLIC10 FORMAT=I3 VAR=1 CASES=ALL
FINISH
```

(b) statement to compare isokinetic and isometric exercise by one way analyses of variance (using * spss)

```
RUN NAME         COMSYSTOLIC
FILE NAME        COMSYSTOLIC
VARIABLE LIST    V1
INPUT FORMAT     FIXED(F3.0)
INPUT MEDIUM     DISK
SUBFILE LIST     SYSTOL1(24),SYSTOL2(24),SYSTOL3(24),SYSTOL4(24),SYSTOL5(24)
ONEWAY           V1 BY SUBFILES/RANGES=SCHEFFE/
STATISTICS       ALL
FINISH
```

20. Format statement for comparison of isokinetic and isometric exercise - diastolic blood pressure

(a) statement to get raw data combination of maximum isokinetic exercise (first exercise bout) and maximum voluntary contraction in isometric exercise (using * midas)

```
READ FILE=ISOKEXBP FORMAT=8X,I2 VAR=1 LABEL=DIASTOLIC1 CASES=1-24
READ FILE=ISOKEXBP FORMAT=28X,I2 VAR=1 LABEL=DIASTOLIC2 CASES=25-48
READ FILE=ISOKEXBP FORMAT=48X,I2 VAR=1 LABEL=DIASTOLIC3 CASES=49-72
READ FILE=ISOMEXQDBP FORMAT=3X,I3 VAR=1 LABEL=DIASTOLIC4 CASES=73-96
READ FILE=ISOMEXHMBP FORMAT=3X,I3 VAR=1 LABEL=DIASTOLIC5 CASES=97-120
WRITE FILE=DIASTOLIC10 FORMAT=I3 VAR=1 CASES=ALL
```

(b) statement to compare isokinetic and isometric exercise by one way analyses of variance (using * spss)

```
RUN NAME        COMDIASTOLIC
FILE NAME       COMDIASTOLIC
VARIABLE LIST   V1
INPUT FORMAT    FIXED(F3.0)
INPUT MEDIUM    DISK
SUBFILE LIST    DIASTOL1(24),DIASTOL2(24),DIASTOL3(24),DIASTOL4(24),DIASTOL5(24)
ONEWAY          V1 BY SUBFILES/RANGES=SCHEFFE/
STATISTICS      ALL
FINISH
```

21. Format statement for comparison of isokinetic and isometric exercise - mean blood pressure

(a) statement to get raw data combination of maximum isokinetic exercise (first exercise bout) and maximum voluntary contraction in isometric exercise (using * midas)

```
READ FILE=ISOKEX FORMAT=(T153,F6.2) VAR=1 LABEL=MBP1 CASES=1-24
READ FILE=ISOKEX FORMAT=(T182,F6.2) VAR=1 LABEL=MBP2 CASES=25-48
READ FILE=ISOKEX FORMAT=(T210,F6.2) VAR=1 LABEL=MBP3 CASES=49-72
READ FILE=ISOMEXQD FORMAT=(T50,F6.2) VAR=1 LABEL=MBP4 CASES=73-96
READ FILE=ISOMEXHM FORMAT=(T50,F6.2) VAR=1 LABEL=MBP5 CASES=97-120
WRITE FILE=MBP10 FORMAT=F7.2 VAR=1 CASES=ALL
FINISH
STOP
```

(b) statement to compare isokinetic and isometric exercise by one way analyses of variance (using * spss)

```
RUN NAME          COMMBP
FILE NAME         COMMBP
VARIABLE LIST     V1
INPUT FORMAT      FIXED(F7.2)
INPUT MEDIUM      DISK
SUBFILE LIST      MBP1(24),MBP2(24),MBP3(24),MBP4(24),MBP5(24)
ONEWAY            V1 BY SUBFILES/RANGES=SCHEFFE/
STATISTICS        ALL
FINISH
```

22. Format statement for comparison of isokinetic and isometric exercise - modified tension time index

(a) statement to get raw data combination of maximum isokinetic exercise (first exercise bout) and maximum voluntary contraction in isometric exercise (using * midas)

```
READ FILE=ISOKEX FORMAT=(T236,F6.2) VAR=1 LABEL=MTTI1 CASES=1-24
READ FILE=ISOKEX FORMAT=(T264,F6.2) VAR=1 LABEL=MTTI2 CASES=25-48
READ FILE=ISOKEX FORMAT=(T292,F6.2) VAR=1 LABEL=MTTI3 CASES=49-72
READ FILE=ISOMEXOD FORMAT=(T78,F6.2) VAR=1 LABEL=MTTI4 CASES=73-96
READ FILE=ISOMEXHM FORMAT=(T78,F6.2) VAR=1 LABEL=MTTI5 CASES=97-120
WRITE FILE=MTTI100 FORMAT=F7.2 VAR=1 CASES=ALL
FINISH
```

(b) statement to compare isokinetic and isometric exercise by one way analyses of variance (using * spss)

```
    1     RUN NAME        COMMTTI
    2     FILE NAME       COMMTTI
    3     VARIABLE LIST   V1
    3.5   INPUT FORMAT    FIXED(F7.2)
    5     INPUT MEDIUM    DISK
    6     SUBFILE LIST    MTTI1(24),MTTI2(24),MTTI3(24),MTTI4(24),MTTI5(24)
    8     ONEWAY          V1 BY SUBFILES/RANGES=SCHEFFE/
    9     STATISTICS      ALL
   10     FINISH
END OF FILE
```

23. Format statement for comparison of isokinetic and isometric exercise - pulse pressure

(a) statement to get raw data combination of maximum isokinetic exercise (first exercise bout) and maximum voluntary contraction in isometric exercise (using * midas)

```
READ FILE=ISOKEX FORMAT=(T320,F6.2) VAR=1 LABEL=PP1 CASES=1-24
READ FILE=ISOKEX FORMAT=(T349,F6.2) VAR=1 LABEL=PP2 CASES=25-48
READ FILE=ISOKEX FORMAT=(T378,F6.2) VAR=1 LABELS=PP3 CASES=49-72
READ FILE=ISOMEXQD FORMAT=(T107,F6.2) VAR=1 LABEL=PP4 CASES=73-96
READ FILE=ISOMEXHM FORMAT=(T107,F6.2) VAR=1 LABEL=PP5 CASES=97-120
WRITE FILE=PP10 FORMAT=F7.2 VAR=1 CASES=ALL
FINISH
```

(b) statement to compare isokinetic and isometric exercise by one way analyses of variance (using * spss)

```
RUN NAME         COMPP
FILE NAME        COMPP
VARIABLE LIST    V1
INPUT FORMAT     FIXED(F7.2)
INPUT MEDIUM     DISK
SUBFILE LIST     PP1(24),PP2(24),PP3(24),PP4(24),PP5(24)
ONEWAY           V1 BY SUBFILES/RANGES=SCHEFFE/
STATISTICS       ALL
FINISH
```