WEIGHTLIFTING TRAINING: EFFECTS ON CIRCULATORY RESPONSES DURING WEIGHTLIFTING AND ACTIVITIES OF DAILY LIVING IN OLDER MEN

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ABSTRACT

Recent studies have demonstrated that increases in dynamic strength after weight-training in healthy subjects were associated with reductions in heart rate (HR) and arterial blood pressure (ABP) during formal lifting of identical absolute loads (McCartney et al., 1989; Sale et al., 1990). This study investigated whether the effect could be transferred to strength-related activities of daily living in healthy older men. The effects of 10 weeks (30 sessions) of progressive dynamic weightlifting training on HR and ABP in 10 weight-trained (wttrain) subjects were compared with 5 control subjects. Before and after training intra-brachial artery pressure and HR were monitored continuously during: 10 repetitions of single-arm curl (SAC) and single-arm military press (SAMP) at 70 % of initial 1 repetition maximum (1 RM); 12 repetitions of single- (SLP) and double-leg press (DLP) exercise at 80% of initial 1 RM; 10 mins treadmill walking at 2.5 mph, carrying 20 and 30 pound loads between mins 4-6 and 8-10 respectively (T-10); 4 mins of treadmill walking at 3.0 mph up an incline of 8% (T-4); 12 flights of stairclimbing at 60 steps/min on a Stairmaster 6000 Ergometer (STR).

In the wttrain group the 1 RM in SAC, SAMP, SLP and DLP increased overall by 61 ($p < 0.007$), 30 ($p < 0.001$), 27 ($p<$

0.001) and 27 per cent ($p < 0.001$), respectively. After training the mean maximal systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), heart rate (HR), and rate-pressure product (RPP; 10^3) values in all 4 weightlifting exercises were lower. The decreases were only significant however, for the DBP in the SAC (144.0 ± 14.9 to 110.0 ± 5.2 Torr; $p < 0.001$), SAMP (151.0 ± 5.9 to 144.0 ± 5.4 Torr; $p < 0.007$), the MAP for the DLP (154.0 ± 5.0 to 147.0 ± 5.0 Torr; $p < 0.021$) and RPP for the SAC (22.7 ± 2.2 to 19.1 ± 1.4; $p < 0.041$). The same respective measurements in the control group were either unchanged or higher.

After training, there were overall reductions in the SBP ($p < 0.05$, mins 8-10), DBP , MAP and RPP ($P < 0.05$, mins 1-4) responses during T-10 with consistently higher values found in the control group. Similar, but nonsignificant patterns emerged for T-4. In contrast, there was little or no reduction in any of the measured parameters during stairclimbing. It was concluded that improved strength in older subjects results in an attenuated HR and ABP response during weightlifting, and there is a modest transfer of this effect to certain activities of daily living which involve the trained muscles.

TO THE LOVING MEMORY OF MY AUNT GLADYS

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1.0 BACKGROUND AND STATEMENT OF PURPOSE

1.1 Introduction

Older adults aged 65 years and over will form an increasingly large part of the Canadian population. Presently, the figure is 11% or approximately 2.9 million people and it is estimated that this proportion will rise to 5 million or 18% by 2021 (Statistics Canada, 1990). With the normal aging process, Canadians in this age group will experience a decline in skeletal muscle and cardiorespiratory function which is characterized by disability, and increased usage of health care resources (Vallbona & Baker, 1984).

Age-related decrements in muscle strength may lead to physical dependency on others for self-care activities, and decreased life satisfaction. Physical activity to improve strength may attenuate the normal rates of functional decline, and improve the capacity for work and recreational activities.

Recent studies examining the effectiveness of weightlifting training have confirmed that older adults can substantially increase strength, and that older muscle responds in a qualitatively similar manner as young muscle (Frontera et al., 1988; Brown et al., 1990). Further research investigating the cardiovascular changes associated with resistance exercise found that an overall increase in strength of 32% resulted in lower heart rate and arterial blood

pressure responses when subjects lifted the same absolute weights (McCartney et al., 1989).

Based on these observations, it would appear that weightlifting training is not only effective in terms of improving muscle strength, but may result in decreased circulatory responses during specific lifting exercises. It may be possible that improved strength of the muscle groups involved in activities of daily living will result in similar attenuation of heart rate and arterial blood pressure responses. Thus, normal everyday activities, such as walking or stairclimbing, would be carried out with a lower myocardial oxygen cost, and weightlifting would assume even greater significance in old age. This is the scope of the current thesis investigation.

1.2 Regulation of Arterial Blood Pressure

The regulation of the cardiovascular system is complex and depends on neural, chemical and renal controls that act continuously to modify and adjust cardiac output, peripheral resistance and blood volume. The sympathetic and parasympathetic divisions of the autonomic nervous system exert partial control while relying on incoming information from higher brain and from reflexogenic areas of the cardiovascular system including arterial baroreceptors, arterial chemoreceptors, cardiopulmonary vagal afferents and

afferent fibres from skeletal muscle receptors (Mitchell & Schmidt, 1983).

1.2.1 Systemic Hemodynamics

Arterial pressure is directly controlled by flow (cardiac output) and the resistance to flow (Hurst, 1986). This relationship can be derived from the basic formula MEAN ARTERIAL PRESSURE = CARDIAC OUTPUT x TOTAL PERIPHERAL RESISTANCE which indicates that in the presence of an increased cardiac output, pressure is controlled within the normal range only if vascular resistance decreases.

Peripheral resistance is controlled by neural, local and humoral factors (Hurst, 1986). The arterioles are the major site of resistance.

Cardiac output is simply the product of heart rate and stroke volume. The heart rate is primarily regulated by balancing the effects of sympathetic and parasympathetic nerve stimulation (Grodner et al. 1970).

The second factor which determines cardiac output is stroke volume. Starling's Law of the heart suggests that within limits an increase in the end-diastolic volume of the heart increases the force of cardiac contraction. Therefore, an increased venous return automatically increases the length of the ventricular muscle fibres and augments stroke volume.

1.2.2 Role of the Skeletal Muscle Afferent Reflex

The skeletal muscle reflex theory of cardiovascular control states that afferent fibres in muscle, through a feedback loop, send neural signals which reflexly activate the cardiovascular control areas in the medulla (Mitchell, 1990).

1.2.2.1 Afferent Fibres from Skeletal Muscle and their Receptors

The afferent fibres from muscle have been divided into four groups according to conduction velocity and fibre diameter. The large Group I (12-20 μm in diameter) fibres are thickly myelinated with conduction velocities ranging from 79-114 m/s. Group I afferents innervate primary sensory endings in muscle spindles or Golgi tendon organs and are commonly referred to as Ia and Ib afferents, respectively. Group II fibres are somewhat thinner in diameter (2-16 μm) and slower. The receptors of the Group II fibres are the muscle spindle secondary endings and Pacinian corpuscles. Both group III and IV muscle afferents are composed of fine nerve fibres and are thinly myelinated (Group III) or unmyelinated (Group IV) (Shepherd et al., 1981; Mitchell & Schmidt, 1983; Mitchell, 1990).

The receptors of Group III fibres are Paciniform corpuscles and unencapsulated nerve endings. Group IV fibres have the slowest conduction velocity (0.3 - 2 m/s) and stem

from only unencapsulated nerve endings (Shepherd et al., 1981; Mitchell & Schmidt, 1983; Mitchell, 1990).

1.2.2.2 Receptive Properties and Cardiovascular Responses of Skeletal Muscle Afferents

It is well known that electrical, chemical and mechanical events in skeletal muscle elicit changes in arterial blood pressure (Hunt, 1895; McCloskey & Mitchell, 1972; Mitchell & Schmidt, 1983). Earlier work by Hunt (1895) suggested that there were specific pressor and depressor afferent fibres, although recent evidence indicates such a theory is too simplistic.

Group I and Group II muscle afferents, which chiefly innervate muscle spindles and tendon organs, have little or no influence on cardiovascular function (McCloskey & Mitchell, 1972; McCloskey et al., 1972; Kaufman et al., 1982; Mitchell & Schmidt, 1983; Mitchell, 1990).

However, Group III and Group IV neural afferents can cause an increase in heart rate, cardiac output and arterial pressure (McCloskey & Mitchell, 1972; Kaufman et al., 1982). McCloskey & Mitchell (1972) used direct current anodal blockade of the dorsal roots to preferentially block Group I and II muscle afferents in order to determine which muscle afferents were responsible for alterations in the response of the cardiovascular system. It was found that when the triceps surae muscle in cat was made to contract, inducing an increase in blood pressure, heart rate and ventilation, blockade of the

large myelinated fibres had no effect on these cardiovascular changes (McCloskey & Mitchell, 1972). In contrast, lidocaine, which selectively blocks the Group III and Group IV fibres has been shown to abolish the cardiovascular responses caused by induced muscle contraction (McCloskey & Mitchell, 1972). It appears that Group III and Group IV afferents are activated not only by mechanical stimuli, but by arterial injections of strong chemical agents which can act as pain producing substances including KCl, acetylcholine, histamine and bradykinin (Kniffki et al., 1981; Shepherd et al., 1981). Arterial infusions of potassium solutions into dog and cat hindlimb have been shown to increase blood pressure (Wildenthal et al., 1968; McCloskey & Mitchell, 1972). A similar finding was found by Kaufman et al. (1982) after injection of capsaicin into the arterial supply of the hindlimb of dogs. However, it was suggested that Group IV afferents were primarily responsible for causing the reflex increases in cardiovascular function (Kaufman et al., 1982). Conversely, selective stimulation of Group I and Group II fibres with intra-arterial doses of succinylcholine had no effect on the blood pressure response (Waldrop et al., 1984).

Therefore, the endings of fine afferent fibres may serve both as metabolic receptors to initiate circulatory changes during muscle contraction and as pain receptors (Shepherd et al., 1981). Recent studies recording directly from individual afferent units have provided substantial

evidence that both Group III and IV muscle afferents consist of two major types of receptors, which have been named ergoceptors and nociceptors (Kniffki, 1981; Mitchell et al., 1983; Mitchell & Schmidt, 1983; Mitchell, 1990). Ergoceptors operate in the nonnoxious domain and are activated by muscular activity or by local touch or pressure (low threshold units), whereas nociceptors, or high threshold units, are only excited by noxious stimuli and are responsible for the sensation of muscle pain (Mitchell & Schmidt, 1983; Mitchell, 1990).

Further support that the reflex pressor response from muscle is mediated by activation of Group III and Group IV fibres is based on the effects of induced static contraction of skeletal muscle. At the onset of ventral root stimulation of Group III fibres there appears to be a sudden explosive burst of impulses which quickly decreases over the contraction period as the muscle produces less tension (Kaufman et al., 1983). This discharge pattern suggested that Group III afferents were reacting to mechanical events in the muscle during contraction (Kaufman et al., 1983). When the impulse activity of Group IV afferents were studied, it was found that their firing rates increased as the contraction period progressed (Kaufman et al., 1983). This discharge pattern suggested that Group IV afferents were sensitive to the build up of metabolites (Kaufman et al., 1983). Since Group III fibres are predominantly activated by deformation changes in the contracting muscle they have been called mechanoreceptors,

and the majority of Group IV afferents which respond to increasing chemical changes have been called metaboreceptors (Kaufman et al., 1983).

The nervous system pathways that lead to the expression of the muscle reflex have also been examined. The majority of Group III and Group IV afferents enter the spinal cord via the dorsal root (Shepherd et al., 1981) and ascend in the spinothalamic tract to the cardiovascular centres in the brain (Shepherd et al., 1981). Most studies have shown that the important integration area for the expression of the reflex neural mechanism is the medulla, in particular the ventrolateral medulla which includes the lateral reticular nucleus (Mitchell, 1990). Recordings from cell bodies in the ventrolateral medulla elicit discharge characteristics similar to Group III or Group IV muscle afferents during induced static contraction (Iwamoto & Kaufman, 1987).

1.2.3 The Role of Central Command or Cortical Irradiation of Motor Impulses

The central theory of neural cardiovascular control which was first termed "cortical irradiation" (Krogh & Lindhard, 1913), is currently referred to as "central command", and states that the changes in the cardiovascular system are due to neural impulses that descend from the higher motor centres of the brain and directly activate the cardiovascular control areas in the medulla (Mitchell, 1990).

Several studies provide support for this theory (Asmussen et al., 1943; Eldridge et al., 1981; Eldridge et al., 1985; Waldrop et al., 1986). When subjects are weakened by partial neuromuscular blockade the blood pressure and heart rate responses for a given work load are greater in the weakened than in the normal state (Asmussen et al., 1943). A possible explanation for the increased response is that the central command had to increase in order to maintain the work rate of the weakened muscles (Asmussen et al., 1943).

Waller (1940) demonstrated that electrical stimulation of an area in the rostral brain (the fields of Forel of the subthalamus) of lightly anesthetized cats elicited walking and running movements. Subsequent studies in cats have shown that electrical or chemical stimulation of the subthalamic locomotor region (STLR) causes a cardiovascular response even when the animal is paralysed or heavily anesthetized and is unable to walk (Eldridge et al., 1981; Eldridge et al., 1985; Waldrop et al., 1986). Whether the central neural impulses originate in the motor cortex or other centres such as the hypothalamus requires further elucidation.

1.2.4 Arterial Baroreceptors (Baroreflex) and Cardiopulmonary Vagal Afferents

Arterial baroreceptors, located in the carotid and aortic sinus and in almost every large artery of the neck and thorax, are highly sensitive to stretch and distortion

(Mitchell & Schmidt, 1983). For example, an elevation of arterial blood pressure increases the rate of discharge of the carotid sinus and aortic arch baroreceptors. These afferent nerve impulses travel to the medulla and synapse with neurons in the cardiovascular centres and results in a decreased heart rate, myocardial contractility and arteriolar dilation (Mitchell & Schmidt, 1983). The net result is a reduction in cardiac output, total peripheral resistance and return of blood pressure to normal.

1.2.5 Arterial Chemoreceptors (Chemoreflex)

The chemoreflex is primarily concerned with changes in arterial PO_2, PCO_2, and pH (Rowell, 1980). For example, when the oxygen content decreases sharply, or when hydrogen ion levels increase, the carotid and aortic bodies transmit impulses to the vasomotor centre and reflex vasoconstriction occurs. Since these receptors are more important for the control of respiration, their function is not considered more fully.

1.3 Regulation of the Cardiovascular System During Exercise

1.3.1 Cardiovascular Responses During Dynamic Exercise

During dynamic exercise involving a large skeletal muscle mass, there is a high demand for oxygen to supply the

increased metabolic needs of the contracting muscles (Grimby et al., 1966; Mitchell & Wildenthal, 1974; Asmussen, 1981; Perez-González, 1981; Mitchell & Schmidt, 1983). Cardiac output increases due to elevations in heart rate and stroke volume. Total systemic vascular resistance falls in proportion to the intensity of muscle activity, creating relatively little change in mean arterial pressure (Grimby et al., 1966). Systolic pressure increases, whereas diastolic blood pressure remains unaltered or decreases. Thus, dynamic exercise creates a volume load on the heart.

1.3.2 Cardiovascular Responses During Static Exercise

The principal features of the circulatory responses to static exercise (alterations in muscle tension with little change in muscle length) have been well documented (Alam & Smirk, 1937; Tuttle & Horvath, 1957; Donald et al., 1967; Lind, 1970; Mitchell & Wildenthal, 1974; Asmussen, 1981; Shepherd et al., 1981; Bezucha et al.,1982). Static (isometric) exercise causes a marked increase in mean arterial pressure with relatively small increases in heart rate and cardiac output (Donald et al., 1967; Mitchell & Wildenthal, 1974; Asmussen, 1981; Mitchell & Schmidt, 1983). Mean arterial pressure increases progressively with the duration and force of voluntary muscle contraction in order to offset the mechanical resistance to muscle blood flow, and increase myocardial perfusion pressure (Sheperd et al., 1981). Systolic

and diastolic blood pressures are increased dramatically while stroke volume remains relatively unchanged because of increased contractility in the face of decreased venous return (Lind et al., 1964; Perez-González, 1981). The elevation in arterial pressure in healthy individuals is due to an increased cardiac output (Shepherd, 1981), since total systemic vascular resistance remains relatively constant (Lind et al., 1964; Lind, 1970). The increase in cardiac output is mainly the result of an increased heart rate. Left ventricular end diastolic and end systolic volumes either increase or do not change (Perez-González, 1981). Thus, static exercise creates a pressure load on the heart (Mitchell & Wildenthal, 1974; Hanson & Nagle, 1987).

1.3.3 Neural Mechanisms of Cardiovascular Control: Central Command and the Exercise Pressor Reflex

Studies in man and in conscious animals have shown the importance of the central neural mechanism (Krogh and Lindhard, 1913; Asmussen et al., 1965; Freyschuss, 1970; Goodwin et al., 1972; Freund et al., 1979; Leonard et al., 1985; Mitchell et al., 1989), the reflex neural mechanism (Alam & Smirk, 1937, 1938; Asmussen et al., 1943; McCloskey and Mitchell, 1972; Mitchell et al., 1977) and others have suggested that both mechanisms are operative during exercise (Schibye et al., 1981).

Asmussen et al. (1965) supported the central theory by showing that the heart rate and blood pressure responses

were greater during cycle ergometry at the same workload when partial neuromuscular blockade decreased the strength of the exercising muscle. The greater motor command needed to achieve a given level of muscular work when the subject was weaker suggested that central drive elicited the cardiovascular changes during steady state submaximal exercise.

In contrast, when voluntary leg exercise was compared to direct electrical stimulation of the same muscles, it was found that arterial blood pressure, heart rate and cardiac output increased in relation to oxygen consumption independent of how the muscular work was performed (Asmussen et al., 1943). Fernandes et al. (1990), using epidural anesthesia to block sensory input from working muscles, found that the arterial pressure response to steady-state submaximal and graded dynamic exercise to maximum was lower during epidural anesthesia than in control experiments (Fernandes et al., 1990). These authors suggested that the reflex originating in the exercising muscle was essential for the normal blood pressure response to dynamic exercise.

Whether the central command or the exercise pressor reflex is operative during static exercise has also been the subject of a great deal of interest and controversy. Leonard et al. (1985) studied the effects of partial neuromuscular blockade on the blood pressure and heart rate responses during static contractions with the knee extensor muscles. Maximal

voluntary contractions of each leg were obtained. Static contractions were then performed for 5 minutes at the same absolute force (10% of the original MVC) or with the same relative force (30% of the MVC) performed immediately before exercise sustained for 2 minutes (Leonard et al., 1985). Experiments were performed before and after the administration of tubocurarine or decamethonium which reduced the MVC to 50% of the control value (Leonard et al., 1985). Therefore, the contractions representing the same relative force corresponded to 15% of the control MVC when performed during neuromuscular blockade. It was shown that at the same absolute force, the heart rate and blood pressure responses during neuromuscular blockade were higher than during the control contractions. However, the contractions performed at the same relative force were not different from the control study. These findings suggested that during neuromuscular blockade at the same absolute force, when central command and the intended effort were greater and the force development was the same, the heart rate and blood pressure responses were also greater. In addition, at the same relative force, when central command and the intended effort were believed to be the same and the force developed was only one-half of that during control contractions, the cardiovascular responses were the same during both the experimental and control conditions. Therefore, the cardiovascular responses were elicited according to the intensity of the effort as signalled by

central command (Leonard et al., 1985). Similar effects on heart rate and blood pressure during neuromuscular blockade have been reported for static handgrip contraction (Mitchell et al., 1989).

At the onset of static exercise, heart rate and mean arterial pressure increase immediately (Freyschuss, 1970; Secher, 1985; Iwamoto et al., 1987; Lassen et al., 1989; Friedman et al., 1990). However, stimulation of the peripheral end of spinal ventral roots in cats elicits an increase in heart rate and blood pressure which is delayed by approximately 1.7 seconds (Iwamoto et al., 1987). These findings indicate that the immediate increase in heart rate and blood pressure at the onset of static exercise is generated outside the active muscles and linked to the central command or the will to exercise (Secher, 1985).

The most direct method to study the "exercise pressor reflex" is to electrically stimulate the peripheral ends of sectioned spinal ventral roots in animals to induce contractions in the hindlimb (Mitchell et al., 1977). Using this preparation, Mitchell et al. (1977) found that the heart rate and arterial blood pressure responses increased. When stimulation of the ventral roots was stopped, the cardiovascular responses returned to control values. Furthermore, the transection of the intact dorsal roots which transmit the majority of the sensory input from the contracting hindlimb muscle abolished the previously obtained

cardiovascular changes. The authors concluded that the cardiovascular responses during static exercise were due to a reflex originating in contracting skeletal muscle (Mitchell et al., 1977). The Group III and IV muscle afferents were presumably responsible for this reflex response (McCloskey & Mitchell, 1972). The stimulus that activates the receptors of presumably the fine muscle afferents during exercise remains equivocal. However, metabolic products such as potassium (Wildenthal et al., 1968; McCloskey & Mitchell, 1972; Saltin et al., 1981; Rybicki et al., 1984), a decrease in pH (Victor et al., 1988; Rotto et al., 1989) and prostaglandins have been shown to activate Group IV muscle afferents (Stebbins et al., 1986).

Of course, the two neural mechanisms thought to be operative during exercise are not likely to exist in isolation, but demonstrate important interactions. Thus, the control of the cardiovascular system during exercise becomes increasingly complex and the relative importance of each mechanism has been shown to be dependent on several factors, including the type and intensity of the exercise and the effectiveness of blood flow to meet the increased metabolic needs of the contracting muscle (Mitchell, 1990).

1.3.4 Combined Static-Dynamic Exercise

The combination of static and dynamic work constitutes a large part of daily living activities. At low

levels of intensity in patients with coronary artery disease, Debusk et al. (1979) found that static effort alone produces a lower heart rate and arterial blood pressure response than dynamic or static-dynamic exercise. However when static exercise is added to low-level dynamic effort, the heart rate and arterial blood pressure response is augmented in normal (Kilbom et al., 1981; Evans et al., 1983; Gorden et al., 1983) and cardiac patients (Kerber et al., 1975; Hung et al., 1982; Sheldahl et al., 1983). As the intensity of dynamic exercise increases, the additive cardiovascular effects of static effort are largely attenuated (Kilbom et al., 1981; Hung et al., 1982). It has been suggested that the failure of added static effort to substantially alter dynamic exercise is due to the fact that large muscle group dynamic activity alone taxes the functional limits of the cardiovascular system (Hung et al., 1982). Also, the vasodilation produced by large muscle groups in near maximal dynamic exercise tends to override the vasoconstrictor effects of static effort (Hung et al., 1982). Because combined static and dynamic exercise results in large increases in diastolic pressure, it has been postulated that this may enhance myocardial perfusion (Kerber et al., 1975; DeBusk et al., 1979). The finding that the frequency of myocardial ischemia and ventricular dysrhythmias is unaffected during combined exercise supports this theory (Kerber et al., 1975; DeBusk et al., 1979).

Dynamic weightlifting may be defined as a form of combined static-dynamic exercise consisting of short lasting

(1-2 seconds) isometric, and concentric contractions, followed by eccentric contractions and then brief periods of relaxation.

Several studies have examined the cardiovascular responses to weightlifting exercise in healthy subjects (Hurley et al., 1984; MacDougall et al., 1985; Fleck & Dean, 1987; Fleck, 1988; Effron, 1989) and in cardiac patients (Keleman et al., 1986; Haslam et al., 1988; Crozier Ghilarducci et al., 1989; Wiecek et al., 1990).

At the onset of each lift, extreme elevations in arterial blood pressure have been recorded in healthy young subjects performing to failure (MacDougall et al., 1985). In contrast, coronary artery disease patients (Haslam et al., 1988; Wiecek et al., 1990) and older adults (McCartney et al., 1989) who perform 10 to 15 repetitions at less than 80% 1 RM produce significant, but clinically acceptable increases in arterial blood pressure, which rapidly decline after the last repetition to pre-exercise values or below (MacDougall et al., 1985; Haslam et al., 1988; Wiecek et al., 1990). However, Kelemen et al. (1986) reported minimal increases in blood pressure during repeated lifting of moderate loads probably due to the methodological limitations of auscultation.

During lifting, the intra-arterial pressures increase with successive repetitions with the highest values generally recorded during the final two repetitions of a set (MacDougall et al., 1985; Haslam et al., 1988; McCartney et al., 1989; Wiecek et al., 1990). With sufficient rest

periods, no additional increases in systolic or diastolic pressures have been found for subsequent sets of exercise (Wiecek et al., 1990). The increase in arterial blood pressure during weightlifting may be due to an increase in heart rate and stroke volume as well as vasoconstriction in other nonexercising vascular beds (MacDougall et al., 1985). Intramuscular pressure is increased resulting in mechanical compression of the blood vessels within the active muscle (MacDougall et al., 1985). This increase in arterial blood pressure caused by mechanical compression has been shown to be proportional to the size of the active muscle mass (MacDougall et al., 1985). Consistent with this theory is the finding that the double leg-press elicits higher arterial pressures than the single-arm curl (MacDougall et al., 1985; McCartney et al., 1989). Also, the blood pressure response increases with consecutive repetitions, likely due to recruitment of additional motor units and increased involvement of accessory musculature (MacDougall et al., 1985). Conversely, less dramatic differences have been found between single- and double-leg press exercise (MacDougall et al. 1985). One study of cardiac patients found no consistent effect of muscle mass on arterial pressure, and higher peak intra-arterial pressures were elicited during arm, compared to leg exercise (Haslam et al., 1988). Similarly, Wiecek et al. (1990) recorded the highest mean peak systolic and diastolic pressures during single-arm overhead military press.

Recent findings suggest that smaller subjects elicit the same peak blood pressure values as larger subjects when performing heavy weightlifting at the same relative intensity (MacDougall et al., 1990). Thus, other factors besides the size of the active muscle mass elevate arterial pressure during weightlifting.

Within a weightlifting activity, the heart rate and arterial pressures increase with increasing percent of maximum. In addition, as subjects perform the lowering phase of the lift, both systolic and diastolic blood pressures decrease rapidly towards normal values. Since the muscle is stronger when contracting eccentrically, the blood pressure response is lower. These findings suggest that the blood pressure response is more dependent on the degree of effort, or percent of MVC, rather than on the absolute force developed (MacDougall et al., 1985). A recent study by MacDougall et al. (1990) extended these findings by showing that the blood pressure response was similar for the same relative effort during eccentric, concentric and isometric contractions, despite large differences in absolute force production between each exercise modality. The authors concluded that the magnitude of the pressor response for weightlifting and static exercise was determined by the central neural mechanism, since differences in absolute force production did not alter the neural output of the mechanoreceptors in muscle (MacDougall et al., 1990). The magnitude and the speed at which heart

rate and arterial blood pressure increase at the onset of exercise also suggests that a central neural mechanism plays a major role in the cardiovascular changes to weightlifting. However, the drop in blood pressure that consistently occurs immediately after exercise may also be attributed to vasodilation in the contracting muscle (MacDougall et al., 1985).

Increased intrathoracic pressure as a result of the Valsalva maneuver can contribute to excessive elevations in systemic blood pressure (MacDougall et al., 1990). However, subjects are unlikely to perform the Valsalva maneuver until the intensity of the weightlifting exceeds 80 per cent of 1 RM, or unless repetitions are performed to failure (MacDougall et al.,1990). Moreover, the Valsalva maneuver plays an important protective role for the heart and cerebral vasculature during lifting of heavy weights (MacDougall et al., 1985).

Stairclimbing is another exercise performed during daily living. Most studies have examined the metabolic efficiency of stairclimbing (O'Connell et al., 1986) and stepping tests have been formulated and widely used as indicators of fitness (Nagle et al., 1965). However, the circulatory adjustments to stairclimbing are not well understood. Oldenburg et al. (1979) found that after only 55 seconds of moderately paced stairclimbing the heart rate was 131 bpm in healthy young subjects. The metabolic requirement

for a similar task lasting five minutes was estimated to be 6.2 METS (O'Connell et al., 1986).

1.4 Cardiovascular Adaptations to Exercise Training

1.4.1 Aerobic Exercise

The cardiovascular responses to aerobic training have been well documented (Frick et al., 1963; Ekblom et al., 1968; Clausen et al., 1970; Clausen et al., 1973).

1.4.1.1 Cardiovascular Changes at Rest

The major circulatory adaptations at rest are a reduction in heart rate (Frick et al., 1963; Clausen et al., 1970; Clausen et al., 1973; Ehsani et al., 1981; Ehsani et al., 1982; Jennings et al., 1986), and either no change or a slight reduction in stroke volume and cardiac output (Musshoff et al., 1959; Ekblom et al., 1968; De Plaen et al., 1980). However, there is considerable controversy over whether or not aerobic training results in lower resting blood pressure (Frick et al., 1963; Hartley et al., 1969; Ehsani et al., 1981; Ehsani et al., 1982; Adranga et al., 1984; Seals et al., 1985; Jennings et al., 1986; Cunningham et al., 1987; Van Hoof et al., 1989).

1.4.1.2 Cardiovascular Changes During Submaximal Aerobic Exercise

Endurance training results in lower heart rates at submaximal workloads (Hartley et al., 1969; Brundin et al., 1975; Winder et al., 1978; Makrides et al., 1990), while stroke volume increases and cardiac output does not change significantly (Blomqvist & Saltin, 1983). The systemic arteriovenous oxygen differences widens, presumably due to local adaptations in the trained muscles. However, training results in modest changes in arterial blood pressure during submaximal exercise (Ehsani et al., 1981; Ehsani et al., 1982; Seals et al., 1984; Seals & Hagberg, 1984; Hagberg et al., 1989(a); Van Hoof et al., 1989; Makrides et al., 1990). Older individuals who progressed from six months of low intensity to 6 months of high intensity endurance training significantly lowered the mean blood pressure response by 5-12 mmHg at both the same absolute and relative work rates (Seals et al., 1984(a)). Similarly, Makrides et al. (1990) found significant reductions in submaximal mean arterial pressure following 12 weeks of high intensity training in men 60-70 years of age. Comparable reductions have been found in young healthy subjects (Clausen et al., 1973) middle-aged subjects (Van Hoof et al., 1989) and cardiac patients (Ehsani et al., 1981; Ehsani et al., 1982). Seals and Hagberg (1984) concluded that most studies report reductions in blood pressure less than 10 Torr at rest and during submaximal exercise after aerobic training.

Many central and peripheral inputs are involved in the cardiovascular response to exercise, but how any of these are modified by training is not totally clear. The most likely mechanism for the alterations in arterial pressure is a decrease in the sympathetic vasoconstrictive tone and therefore, total peripheral resistance.

1.4.1.3 Cardiovascular Changes at Maximal Exercise

The principal cardiovascular changes to endurance training include an increase in maximal oxygen uptake, stroke volume and cardiac output with no change or a small decrease in maximal heart rate (Ekblom et al., 1968; Blomquist & Saltin, 1983; Musch et al., 1987). The mean blood pressure at maximum $\dot{V}O_2$ has been reported in some studies to be higher (Ekblom et al., 1968; Hagberg et al., 1989), but not different in others (Hartley et al., 1969; Seals et al., 1984; Musch et al., 1987). Since training results in only modest increases in cardiac dimensions with little or no change in intrinsic contractile performance, the primary mechanism for the increase in $\dot{V}O2$ max appears to be an increased peripheral arteriovenous oxygen difference (Blomqvist & Saltin, 1983).

1.4.2 Static and Weightlifting Exercise

It is well documented that progressive resistance training increases muscle size and strength (MacDougall et al., 1977; Aniansson & Gustafsson, 1981; Grimby & Saltin,

1983; Aniansson et al., 1984; Keleman et al., 1986; Haslam et al., 1988; Frontera et al., 1988; McCartney et al., 1988; McCartney et al., 1989; Brown et al., 1990), but how the cardiovascular response is modified with training is unclear.

1.4.2.1 Cardiovascular Changes at Rest

Strength training appears to have little effect on resting blood pressure (Longhurst et al., 1980; Fleck & Dean, 1987).

Longhurst and colleagues (1980) using cuff sphygmomanometry showed that the resting blood pressure of weightlifters was similar to untrained subjects. However, Fleck and Dean (1987) found that the resting systolic and diastolic blood pressures of body builders were 11 Torr and 3 Torr lower, respectively, than controls.

Few prospective training studies have been done which offer insight into the cardiovascular effects of training. A recent study by Cononie et al. (1991) investigated the effects that 6 months of resistance training had on arterial blood pressure in men and women 70-79 years of age. Subjects trained 3 times per week performing one set of 8-12 repetitions on ten different Nautilus machines (Cononie et al., 1991). No changes in arterial pressure at rest were observed and only modest gains in strength of 18 percent overall were found after training (Cononie et al., 1991).

A short-term dynamic weight training programme in patients with coronary artery disease also found no change in resting arterial pressure despite significant gains in strength (Crozier-Ghilarducci et al., 1989).

Lowering of resting heart rate following strength training has been reported by some investigators (Wilmore et al., 1978; Kanakis and Hickson, 1980), whereas no effects (Fleck & Dean, 1987; Crozier-Chilarducci, 1989) or an increase (Cononie et al., 1991) has been found by others. Kanakis and Hickson (1980) reported a significant 7 bpm decrease in resting heart rate in young healthy men after training 5 days per week for 10 weeks. Echocardiography also revealed significant increases in left ventricular wall thickness and left ventricular mass (Kanakis and Hickson, 1980).

1.4.2.2 Cardiovascular Changes During Exercise

Most studies are flawed because of indirect methods (Robinson et al., 1988), and few studies have directly examined the cardiovascular responses during weightlifting (MacDougall et al., 1985; Haslam et al., 1988; MacDougall et al., 1990; McCartney et al., 1989; Wiecek et al., 1990; Sale et al., 1990). However, McCartney et al. (1989) investigated the effects of weightlifting training in healthy men aged 60 to 70 years. Intra-brachial artery pressure was measured continuously as subjects performed 10 repetitions of single-arm curl and single- and double-leg press at loads equal to

60 and 80 percent of the pre-training 1 RM, before and after 12 weeks of progressive weightlifting training. After training, 1 RM strength increased by 32 percent overall and arterial pressures and heart rate values were lower in all exercises and at both intensities (McCartney et al., 1989). The greatest reduction was found in the double-leg press exercise at 80% 1 RM with the systolic and diastolic pressures approximately 40 mmHg lower following training, and heart rate values decreased from 108 to 94 bpm (McCartney et al., 1989). The authors concluded that 12 weeks of progressive resistance training in older men results in an attenuation of arterial blood pressure during repeated lifting of identical absolute loads (McCartney et al., 1989). Similar reductions in arterial blood pressure have been found after 19 weeks of weightlifting training in young healthy subjects (Sale et al., 1990). Furthermore, lower peak intra-arterial pressures and heart rate responses during knee extensions and one-armed overhead military press exercise have been found in body builders when compared to novice weightlifters and controls (Fleck & Dean, 1987).

1.4.2.3 Mechanism(s) Responsible For Exercise Cardiovascular Changes

Studies comparing older and younger individuals suggest that a combination of neural and morphological adaptations occur following strength training (Moritani & de Vries, 1980; Sale, 1988). Moritani and de Vries (1980) found

that older individuals increased strength by alterations in the nervous system, as indicated by significant gains in the level of muscle activation without any significant changes in muscle cross-sectional area. On the other hand, strength gains in younger subjects have been attributed to an initial neural adaptation, and hypertrophy in the later stages of training (Moritani & de Vries, 1980). However recent findings suggest that older adults can experience increases in whole muscle mass and individual fibre cross-sectional areas in response to 12 weeks of overload weight training (Brown et al., 1990).

During lifting of the same absolute load following training, it is tempting to suggest that the mechanoreceptor nerve traffic from muscle would be similar. However, training may require less centrally activated recruitment of motor units to perform the same amount of muscular work. MacDougall et al. (1990) found that during attempted maximal isometric contraction of the knee extensors at 100% MVC for 45 seconds the blood pressure increased over time as absolute force decreased. It was suggested that central command was responsible for the pressor response (MacDougall et al., 1990). Whether central or peripheral mechanisms or other factors operate to lower the blood pressure during weightlifting, after a period of weightlifting training, remains to be determined.

1.5 Purpose

Based on the work of McCartney et al. (1989), short - term dynamic resistance training in older adults results in a marked attenuation of the heart rate and arterial blood pressure responses during repeated weightlifting of identical absolute loads. The purpose of this thesis investigation was to directly determine whether attenuation in arterial pressure and heart rate could be achieved in a similar population of healthy older men and further, if the cardiovascular changes could be transferred to strength-related activities of daily living which involve the trained muscle groups. The present study will yield important information on the arterial blood pressure and heart rate responses to activities of daily living, and provide much needed data using direct measurement techniques. It is possible that the results of this study, if positive, will have a profound effect on the type of exercise training which is recommended for older adults.

The substantive hypothesis states that weightlifting training will result in significant increases in strength of the trained muscles and will be associated with significant reductions in the cardiovascular responses during lifting of identical absolute loads. Furthermore, the attenuated cardiovascular responses seen during repeated lifting of the same absolute load after training will transfer to strength related activities of daily living which involve the trained muscle groups.

2.0 METHODS

2.1 Subjects

The study group consisted of healthy, untrained male volunteers between 60 and 70 years of age. Public service announcements on local radio and in the newspapers recruited men from the Hamilton region (Appendix A). The criteria for exclusion on medical grounds were: previous myocardial infarction or other types of heart disease; chronic obstructive or restrictive pulmonary disease; evidence of coronary artery disease or arterial hypertension on clinical exercise testing (rise in diastolic pressure of >15 mmHg; maximal systolic pressure of >250 mmHg); >120% of maximum power output during clinical exercise testing; the use of hypertensive medication; orthopedic disability restricting the ability to exercise; cigarette smoking; ideal body weight >130%. This study was approved by the Ethics Committee of McMaster University.

2.2 Study Design

Following a pre-screening questionnaire (Appendix B), an information outline was sent to each subject's family physician to obtain further information and agreement for their patient's participation in the study (Appendix C). Before acceptance into the study, a maximal progressive incremental exercise test was performed on an electrically braked cycle ergometer to screen subjects in accordance with

the aforementioned exclusion criteria. The exercise stress tests were conducted at the Ambrose Cardiorespiratory Unit at McMaster University Medical Centre, Hamilton, Ontario. The purpose and associated risks of the study were explained to each subject and signed informed consent was freely obtained (Appendix D). Subjects were assigned to either a weightlifting training group or a control group. Before and after the intervention period, subjects completed several tests of weightlifting and exercise capacity with intra-brachial artery pressures monitored continuously.

With the exception of the clinical exercise test, all other testing was conducted in the exercise rehabilitation laboratory, Department of Physical Education, McMaster University, Hamilton, Ontario.

2.3 Testing Protocol

2.3.1 Orientation

One week before the pre-training testing, subjects were orientated to the testing equipment which included a treadmill (Quinton, 55xt, Quinton Instrument Co.,Seattle, Washington), a Stairmaster 6000 ergometer (Stairmaster Sports/Medical Products, Newburgh, New York), a Global Gym multistation weightlifting apparatus (Global Gym Inc., Downsview, Ontario) and a seated arm curl weightlifting device (Rubicon Industries, Stoney Creek, Ontario) . Subjects were shown the proper technique for each weightlifting exercise and

were instructed to exhale during the lifting phase of the movement to avoid the Valsalva maneuver. The optimal seat placement was determined for the single arm curl and leg press exercises and each subject's one repetition maximum (maximum lifting capacity in a single repetition) (1RM) was obtained during several trials. Maximal handgrip strength was measured using a hand held dynamometer (model no. 78010). Practice lifting and orientation to the equipment was to allow for habituation effects (Appendix E).

2.3.2 Measurement of Intra-Arterial Blood Pressure

Intra-brachial artery pressure was recorded continuously before, during and after the weightlifting and the walking exercises. A local anesthetic (xylocaine 2%) was administered prior to the insertion of a 20-gauge Angiocath (Deseret Medical Inc.,Park Davis and Co., Sandy, Utah) into the brachial artery of the subject's non-dominant arm. The pressure responses were recorded using a Novatrans transducer (MX 800, Medex Inc., Hilliard, Ohio) positioned at midsternum level, an amplifier (Gould Inc.,Instruments Division, Cleveland, Ohio) and a chart recorder (RS3-5P,General Scanning Inc.). The transducer was calibrated statically against a mercury manometer and calibrated dynamically using square wave signals. The strip recorder operated at a speed of 5 mm/s. The peak systolic (SBP) and diastolic (DBP) blood pressure, and heart rate (HR) values were derived manually from the blood

pressure tracings. The mean arterial pressure (MAP) in each exercise was derived from electronically calculated pressure integrals each equivalent to 400 Torr•s. Thus, the MAP was calculated using the following formula:

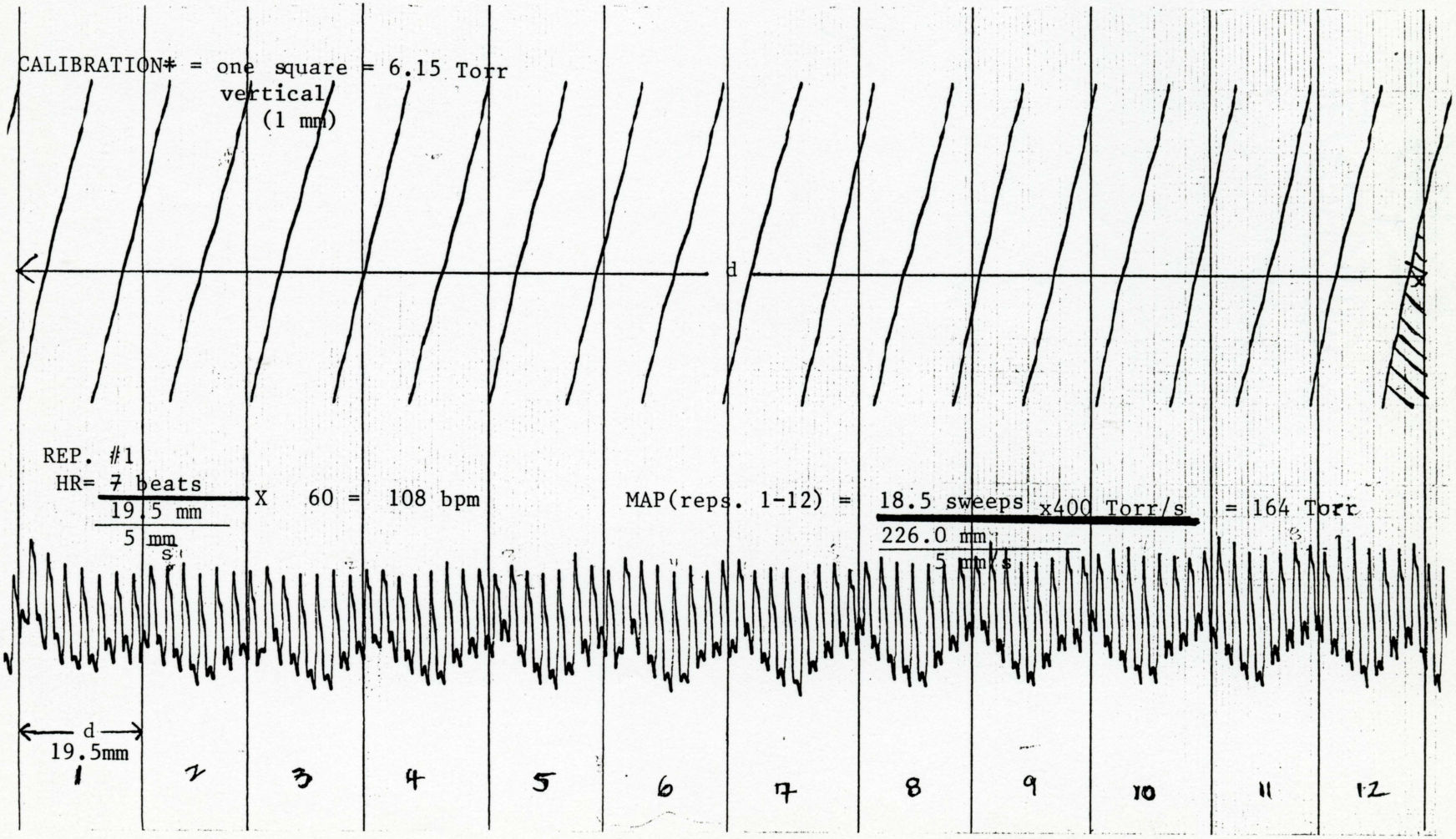
$$\frac{\text{\# of pressure integrals or sweeps} \times 400\ \text{Torr•s}}{\text{elapsed time (s)}}$$

A similiar formula was used to determine the HR response (Figure 1). Rate-pressure product (RPP) was calculated as the product of peak SBP and HR.

2.3.3 Heart Rate and Intra-Arterial Blood Pressure Responses During Weightlifting

The weightlifting tasks were performed on a Global Gym multistation apparatus with the exception of the single arm curl, which was done on the seated arm curl device. Subjects performed one set of 10 repetitions in each of single arm curl and single arm military press at 70 % 1 RM using the non-catheterized arm. Both single- and double leg press exercises comprised 12 repetitions at 80 % 1 RM. Each subject was instructed to exhale during the lifting phase of the exercise and lifted rhythmically in step with a verbal command. A recovery of at least two minutes was allowed after each completed set of weightlifting. The sequence of lifting exercises was selected at random (Appendix E).

Figure 1. A typical intra-arterial blood pressure tracing for the double-leg press exercise at 80 % of the pre-training 1 RM (subject B) and a sample calculation of heart rate for repetition #1 and mean arterial pressure (repetitions 1-12).


CALIBRATION* = one square = 6.15 Torr
vertical
(1 mm)
d
REP. #1
HR= 7 beats
19.5 mm
5 mm/s
X 60 = 108 bpm
MAP(reps. 1-12) = 18.5 sweeps x400 Torr/s = 164 Torr
226.0 mm
5 mm/s
d
19.5mm
1
2
3
4
5
6
7
8
9
10
11
12

2.3.4 Heart Rate and Intra-Arterial Blood Pressure Responses During Treadmill Walking and Stairclimbing

The heart rate and intra-arterial blood pressure responses were recorded continuously during: 10 minutes of horizontal treadmill walking at 2.5 mph carrying a bag containing a 20 pound weight between the fourth and sixth minutes, and a 30 pound weight between the eighth and tenth minutes; four minutes of walking at 3.0 mph up an incline of 8% ; 12 flights of stairclimbing ergometry at a speed of 60 steps/minute. The responses to a one minute isometric handgrip using the dominant arm (50% MVC) were also recorded. Throughout the testing subjects were instructed to breathe freely and avoid gripping the railings or safety bars on the treadmill or stairclimbing ergometer. A 10 to 15 minute recovery period between tests ensured that the heart rate and blood pressure responses returned to resting levels. The order of testing for the simulated activities of daily living was selected at random (Appendix E).

2.3.5 Heart Rate and Intra-Arterial Blood Pressure Responses Post-Intervention

An identical testing protocol was employed after the 10 weeks of training. In addition, subjects in the exercise group did 10 repetitions of single arm curl and single arm military press at 70 %, and 12 repetitions of single- and

double leg press exercises at 80% of their post-training 1 RM (Appendix E).

The same procedures and testing protocols were used for the control subjects. The 1 RM values for each weightlifting exercise were re-evaluated one week prior to the post-testing session to monitor any strength gains or losses.

2.4 Strength Training Regime

Training sessions were conducted three times per week (Monday, Wednesday, Friday) for a total of 10 weeks (Figure 2). Each training session lasted approximately one hour and included the following: (A) Warm up /stretching (10 minutes); (B) Weightlifting exercises: (1) right leg press (2) left leg press (3) double leg press (4) right arm curl (5) left arm curl (6) right arm military press (7) left arm military press (8) seated dead lift (9) bench press (10) abdominal curls; (C) Warm down/stretching. One repetition maximal values were not obtained for exercises 8,9 and 10; however, subjects performed three sets of 10 repetitions using low weights. The design was employed to recruit the major muscle groups of the body. The circuit set system was used, one set of repetitions was completed for each exercise and repeated up to a maximum of three circuits. Reevaluation of the subjects 1 RM was conducted every sixth session to monitor strength gains and to readjust the training loads accordingly.

Figure 2. The design of the weight-training programme.

Weightlifting Group
Training Regime
(30 sessions, 3 times/week)

Week 1: (session # 1-3)	2 sets at 50% 1RM,	10 repetitions (arms) 10 repetitions (legs)
Week 2: (session # 4-6)	3 sets at 60% 1RM,	10 repetitions (arms) 10 repetitions (legs)
(REEVALUATION of 1 RM's in the 6th session)		
Week 3: (session # 7-9)	3 sets at 60% at new 1RM,	10 repetitions (arms) 10 repetitions (legs)
Week 4: (session #10-12)	1 set at 60% 1RM, 2 sets at 70% 1RM	10 repetitions (arms) 10 repetitions (legs)
(REEVALUATION of 1 RM's in the 12th session)		
Week 5: (session #13-15)	1 set at 60% new 1RM 2 sets at 70% new 1RM	10 repetitions (arms) 12 repetitions (legs)
Week 6: (session #16-18)	1 set at 60% 1RM 2 sets at 70% 1RM	10 repetitions (arms) 12 repetitions (legs)
(REEVALUATION of 1 RM's in the 18th session)		
Weeks 7,8: (session #19-21, #22-24)	1 set at 70% 1RM 2 sets at 80% 1RM	10 repetitions (arms) 15 repetitions (legs)
(REEVALUATION of 1 RM's in the 24th session)		
Weeks 9,10: (session #25-27, #28-30)	1 set at 70% new 1RM 2 sets at 80% new 1RM	10 repetitions (arms) 15 repetitions (legs)
(REEVALUATION of 1 RM's in the 30th session)		

Adopted from: McCartney et al. 1988.

2.5 Subject Information and Instruction

Individual log books were used to record training information, for motivation, and to provide a record of compliance (Appendix F).

Supervised training sessions emphasized proper lifting and breathing techniques. All subjects were instructed to maintain their normal activity levels and dietary intakes throughout the 10 weeks.

2.6 Statistical Analysis

A one way analysis of variance (ANOVA) was performed on baseline Stage 1 stress test data to determine if the two groups were similar with respect to age, height, weight, resting and maximal exercise responses. A two way ANOVA was performed on the direct (catheter) resting measurements pre- and post-training.

Differences between pre- and post training heart rates and blood pressures were analysed using a three-way analysis of variance (one between, two within subject factors; split-plot ANOVA) with repeated measures. A Tukey - "a" post hoc analysis was selected to clarify any specific differences among treatment means. A difference of $P < 0.05$ was considered statistically significant. The arm data analysis was performed with an n=9, due to an injury sustained by one wttrain subject. A Least Squares Linear Regression was used to extrapolate any missing data points.

3.0 RESULTS

3.1 Subject Characteristics

Group assignment produced a wttrain group of 10 and a control group of 5 subjects who were comparable with respect to age, height, weight (Appendix G), resting (Figure 3) and maximum exercise (Figure 4) HR, SBP, DBP, MAP, RPP and power output. All subjects completed the pre- and post-training testing, but one wttrain subject's post-training SAC and SAMP data were not collected due to an arm injury. The arm analyses were performed using an n=9 in the wttrain group. Subjects completed 30 training sessions (Appendix F).

3.2 Effects of Weightlifting Training on Maximum Lifting Capacity and Isometric Strength Measurements

3.2.1 Weightlifting Capacity

One repetition maximum values increased significantly following training in each of the exercised muscle groups, but there were no significant changes in the control group. The measurements of the 1 RM (X ± SEM) for the dominant arm or leg in the wttrain group were: for the SAC a 77 per cent increase (18.5 ± 3.4 to 32.7 ± 6.5 kg, $p < 0.013$); for the SAMP a 31 per cent increase (17.4 ± 1.7 to 22.8 ± 2.0 kg, $p < 0.001$); for the SLP the equivalent of a 28 per cent increase (81.8 ± 5.4 to 104.4 ± 8.7 kg, $p < 0.002$) and; for the DLP a 27 per

Figure 3. Direct intra-arterial (pre- and post- 10 weeks of weight-training or control) and indirect (pre- Stage 1) resting (means ± SE) systolic, diastolic and mean arterial pressure, heart rate and rate-pressure product values (refer to legend).

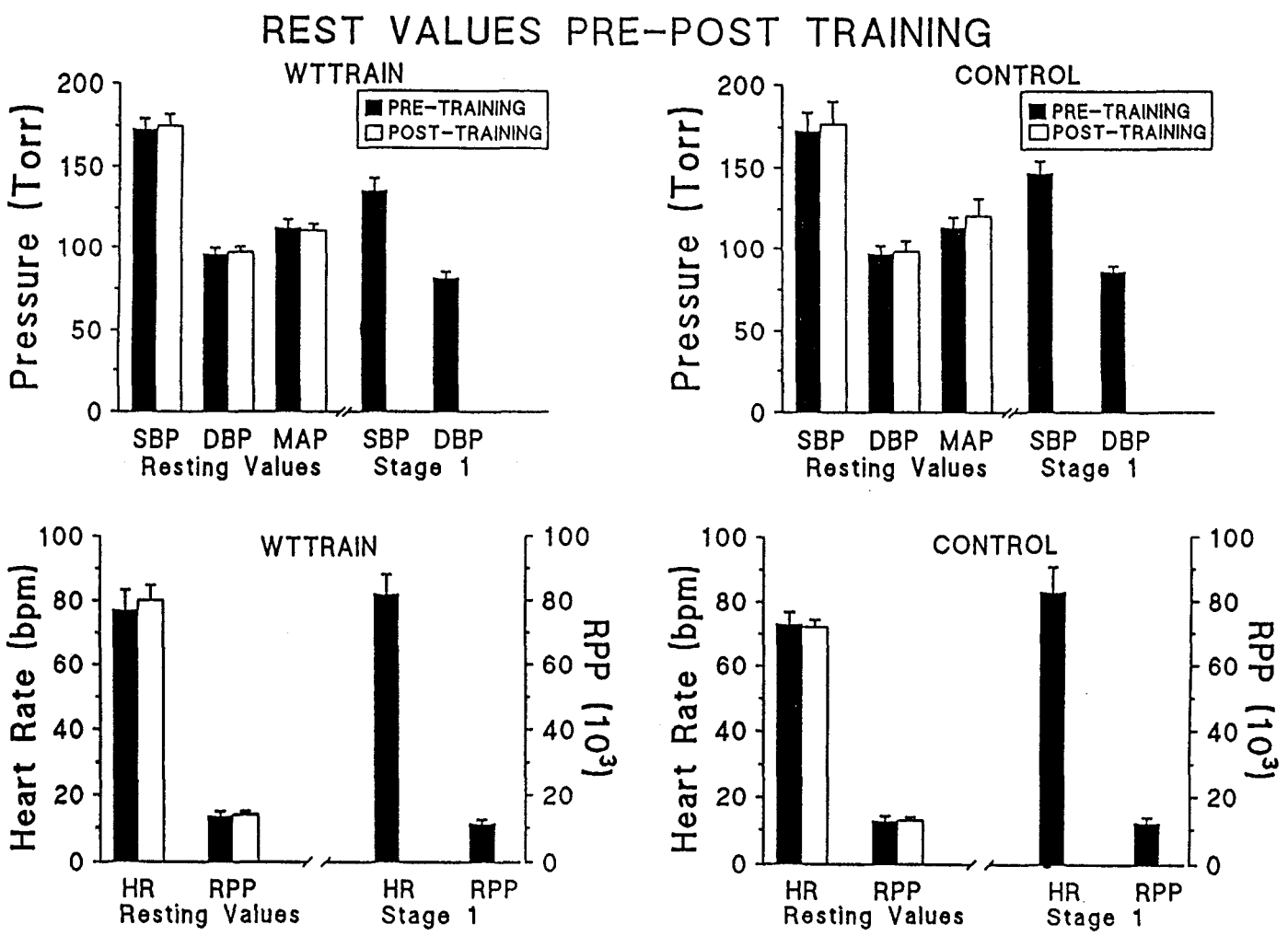
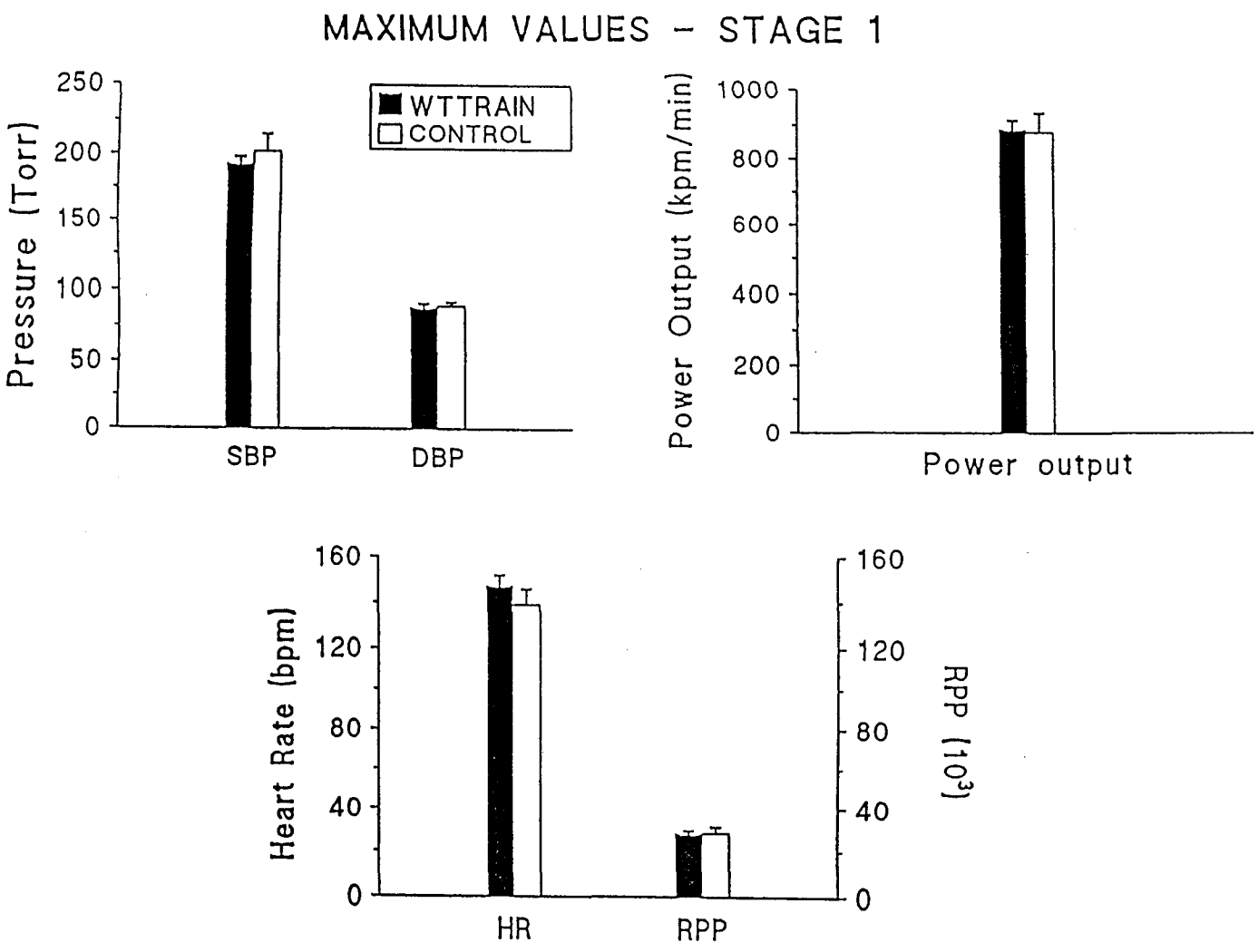

REST VALUES PRE-POST TRAINING
WTTRAIN
CONTROL
PRE-TRAINING
POST-TRAINING
Pressure (Torr)
200
150
100
50
0
SBP DBP MAP SBP DBP
Resting Values
Stage 1
Heart Rate (bpm)
RPP (10³)
100
80
60
40
20
0
HR RPP HR RPP
Resting Values
Stage 1

Figure 4. Stage 1 maximum (means ± SE) systolic and diastolic blood pressure, heart rate, rate-pressure product and power output values, weight-trained group (closed bars) versus control (open bars).


MAXIMUM VALUES - STAGE 1
Pressure (Torr)
250
200
150
100
50
0
WTTRAIN
CONTROL
SBP
DBP
Power Output (kpm/min)
1000
800
600
400
200
0
Power output
Heart Rate (bpm)
160
120
80
40
0
HR
RPP
RPP (10³)

cent increase (150.0 ± 13.6 to 190.2 ± 15.4 kg, $p < 0.001$) (Figure 5). The control group showed no significant changes in 1 RM for the same respective measurements (Figure 5).

In the wttrain group significant improvements in strength were also found for the non-dominant arm and leg: the equivalent of a 45 ($p < 0.015$), 28 ($p < 0.008$) and 27 ($p < 0.001$) per cent increase in the SAC, SAMP, and SLP, respectively (Figure 6). The control group measurements for the non-dominant arm or leg were unchanged (Figure 6).

3.2.2 Maximum Isometric Handgrip Strength

The handgrip performance was not significantly altered for the dominant hand in the wttrain group or in the control group (Figure 7). There was a main effect ($p < 0.021$) for time (pre to post) in the non-dominant hand (46.4 ± 2.4 to 50.9 ± 2.2 kg in the wttrain group; Figure 8).

3.3 Effects of Weightlifting Training on Arterial Blood Pressure and Heart Rate Responses

3.3.1 Resting Values

Resting SBP, DBP, MAP, HR and RPP values were not significantly changed in the wttrain or in the control group (Figure 3).

Figure 5. The 1 RM (means ± SE) of the dominant arm or leg for the single-arm curl, single-arm military press and single-leg press exercises, pre- (closed bars) and post- (open bars) 10 weeks of weight-training or control. Also, the 1 RM for the double-leg press pre- and post- 10 weeks of weight-training or control. * $P < 0.05$.

ONE REPETITION MAXIMUM VALUES PRE-POST TRAINING

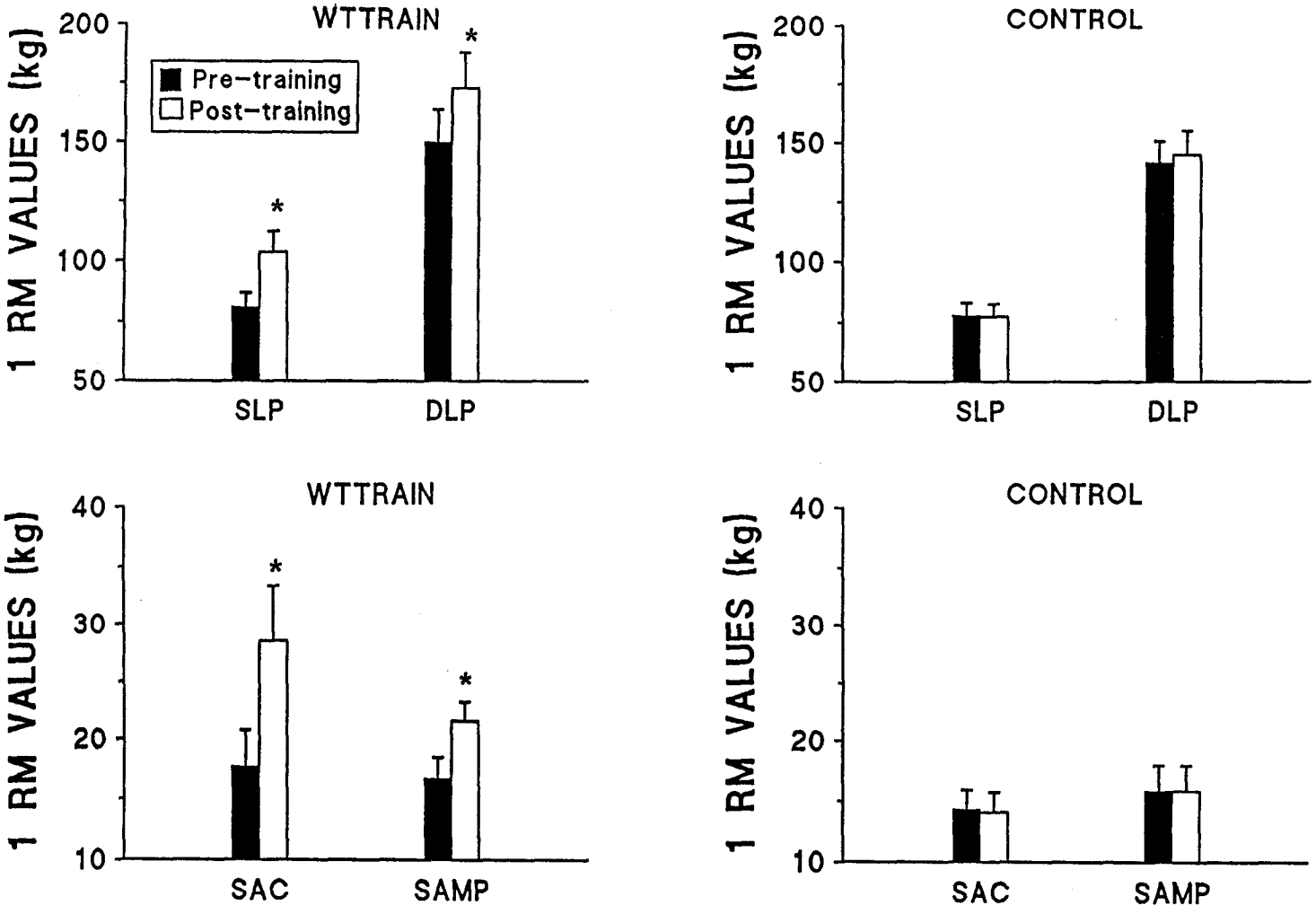


Figure 6. The 1 RM (means ± SE) of the non-dominant arm or leg for the single-arm curl, single-arm military press and single-leg press exercises, pre- (closed bars) and post-(open bars) 10 weeks of weight-training or control. Also, the 1 RM for the double-leg press pre- and post- 10 weeks of weight-training or control. * $P < 0.05$.

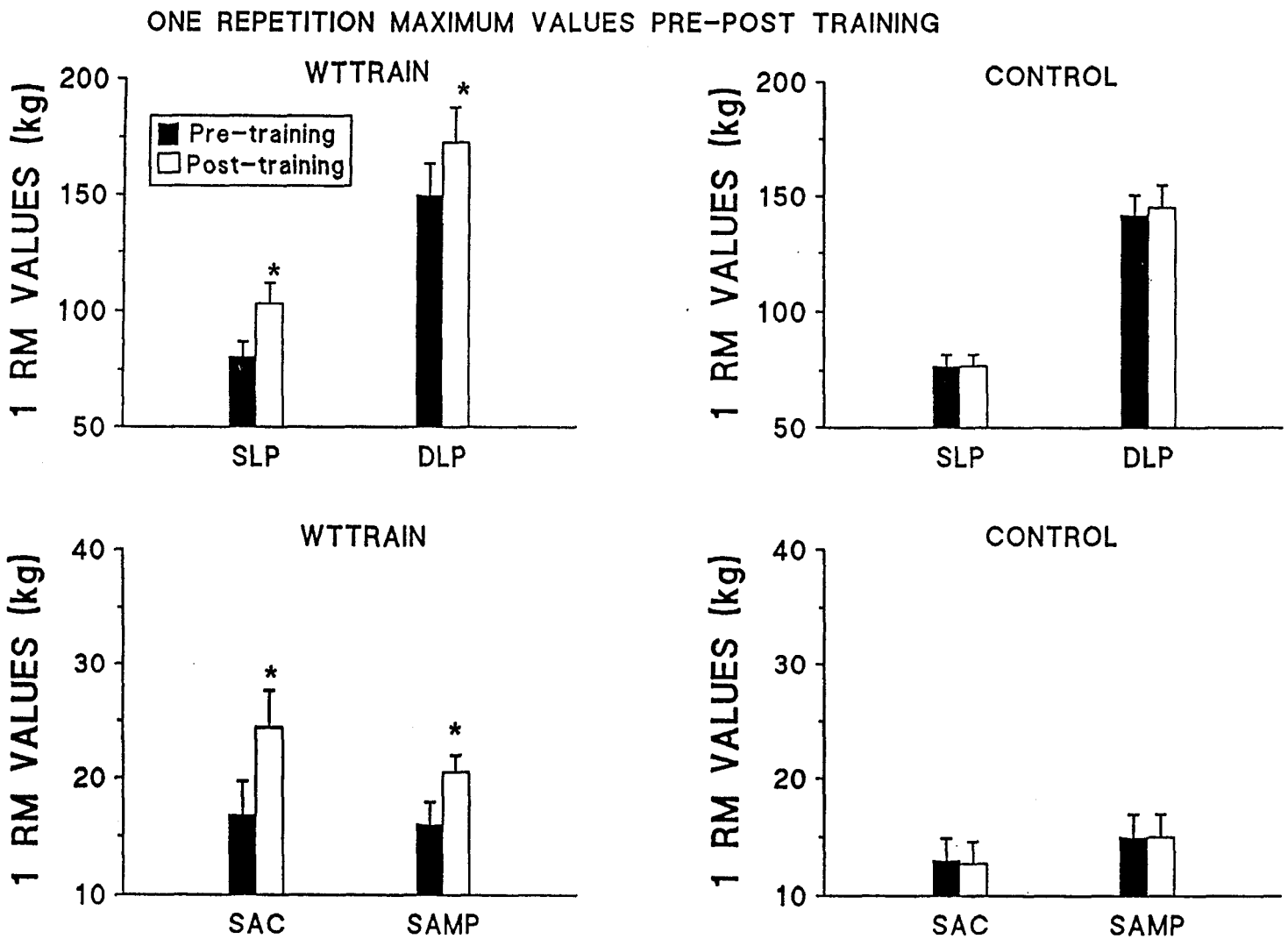

ONE REPETITION MAXIMUM VALUES PRE-POST TRAINING
WTTRAIN
CONTROL
1 RM VALUES (kg)
200
150
100
50
Pre-training
Post-training
*
SLP
DLP
WTTRAIN
CONTROL
40
30
20
10
SAC
SAMP

Figure 7. Maximum (means ± SE) isometric handgrip strength of the dominant hand, pre- (closed bars) and post- (open bars) 10 weeks of weight-training or control.

ONE REPETITION MAXIMUM VALUES PRE-POST TRAINING

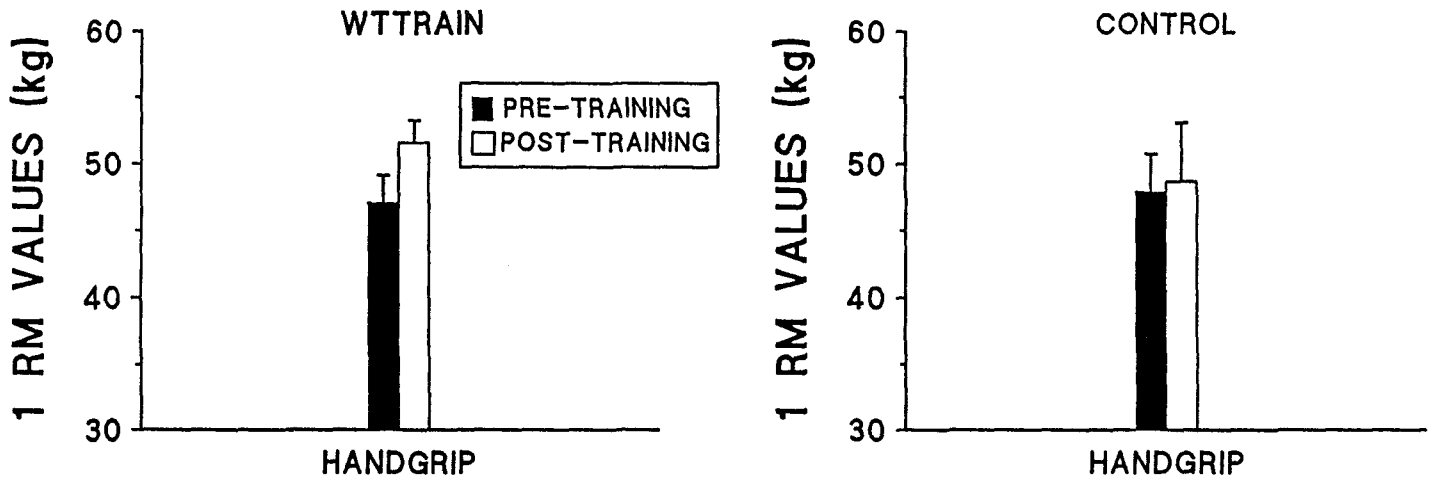
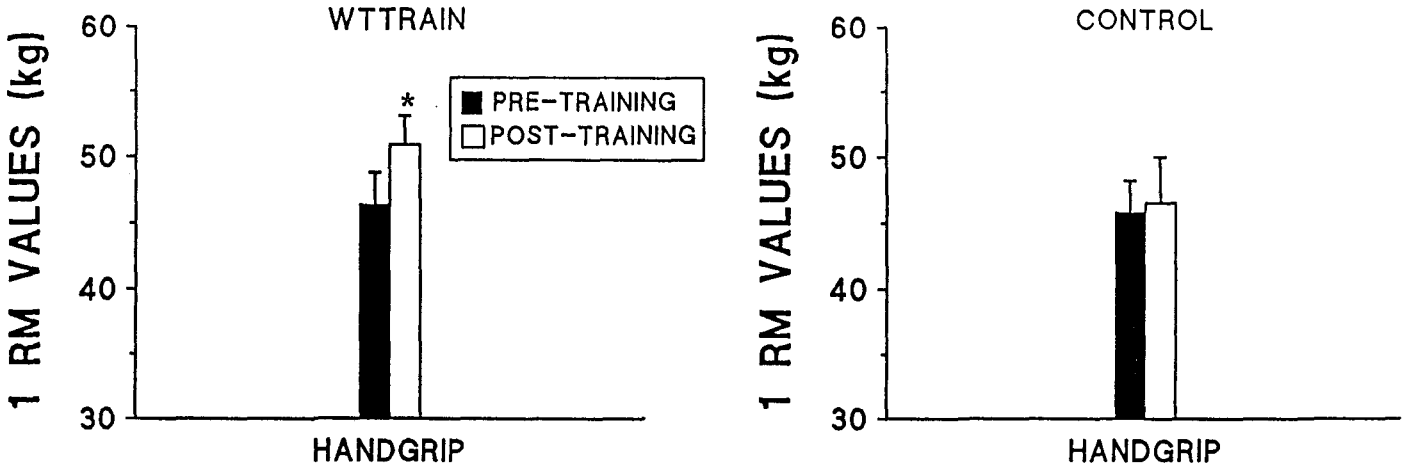


Figure 8. Maximum (means ± SE) handgrip strength of the non-dominant hand, pre- (closed bars) and post- (open bars) 10 weeks of weight-training or control. (main effect for time, * $P < 0.05$).

ONE REPETITION MAXIMUM VALUES PRE-POST TRAINING - NON-DOMINANT



3.3.2 During Lifting at 70 and 80% of the Pre-Training 1 RM

3.3.2.1 Systolic Blood Pressure

Mean maximal systolic pressures during the lifting of identical absolute loads were reduced, although not significantly, after training in all exercises (overall decrease from 241.0 ± 11.3 to 228.0 ± 9.7 Torr; Figures 9, 10, 11, 12), but in the control group the responses were higher for the SAMP (272.0 ± 16.2 to 293.0 ± 20.3 Torr; Figure 12) and decreased only 1.8 per cent overall in the SAC, SLP and DLP (Figures 9, 10, 11).

Training resulted in a nonsignificant decrease in the SBP of 4.3 per cent beyond the 7th repetition in the DLP (238.0 ± 8.2 to 227.0 ± 8.8 Torr) with no systematic change in the control group (Figure 9). The SBP response for the SLP at 80% of pre-training 1 RM was not significantly different in either the wttrain group or in the control group (Figure 10).

A nonsignificant trend for lowering emerged for the SAC (overall from 206.0 ± 11.7 to 193.0 ± 9.3 Torr or a decrease of 6 per cent) in the wttrain group, whereas in the control subjects only a 1.7 per cent reduction was found (Figure 11).

A significant time (pre to post) x group interaction ($p < 0.038$) for the systolic blood pressure response emerged for the SAMP at 70% 1 RM for the control group (241.0 ± 12.7 to

Figure 9. Systolic and diastolic blood pressures (means ± SE) during 12 repetitions of double-leg press at 80 % of 1 RM, pre- and post-(refer to legend) 10 weeks of weight-training or control.

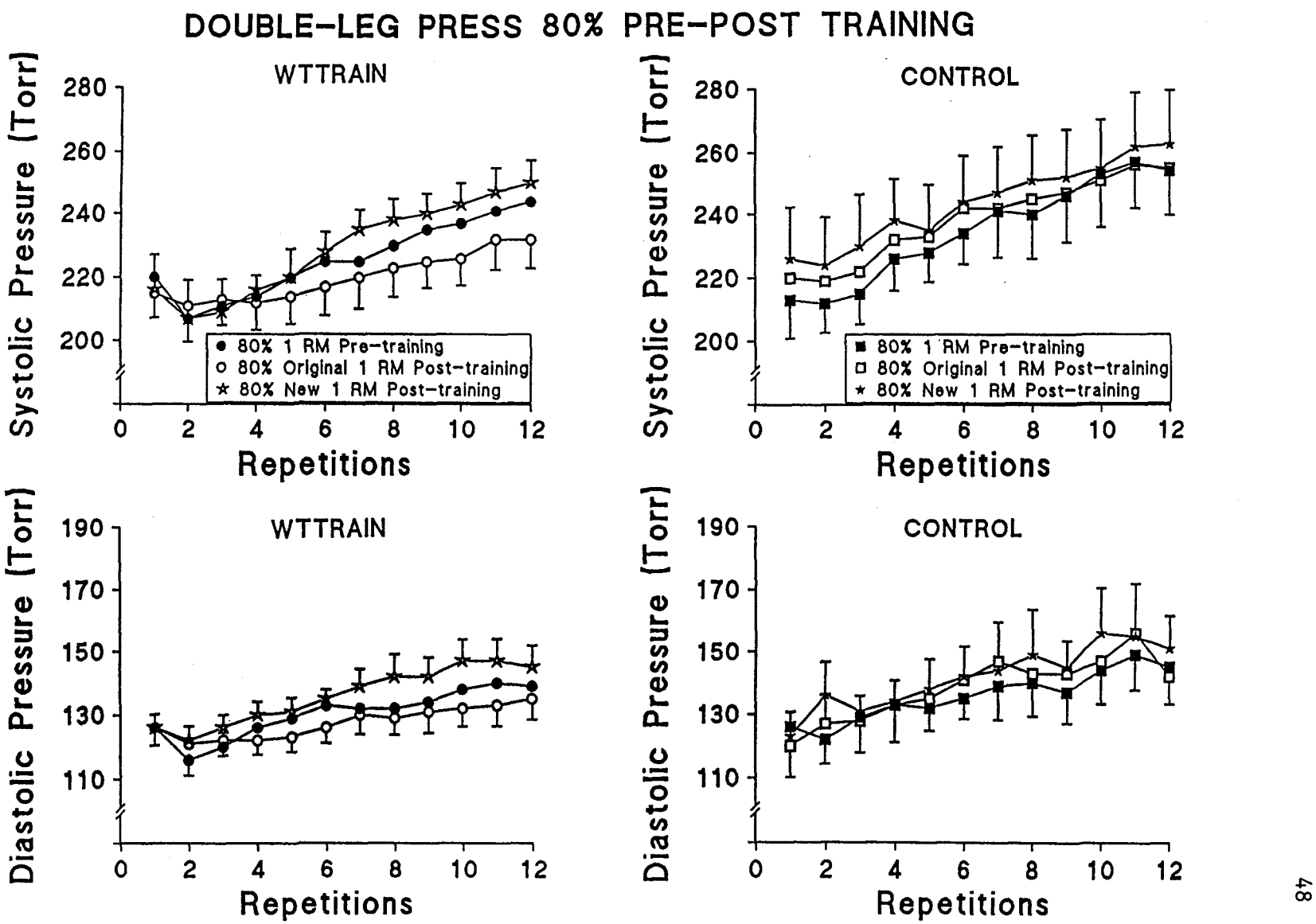

DOUBLE-LEG PRESS 80% PRE-POST TRAINING
WTTRAIN
CONTROL
Systolic Pressure (Torr)
Diastolic Pressure (Torr)
Repetitions
● 80% 1 RM Pre-training
○ 80% Original 1 RM Post-training
☆ 80% New 1 RM Post-training
■ 80% 1 RM Pre-training
□ 80% Original 1 RM Post-training
★ 80% New 1 RM Post-training

Figure 10. Systolic and diastolic blood pressures (means ± SE) during 12 repetitions of single-leg press at 80 % of 1 RM, pre- and post- (refer to legend) 10 weeks of weight-training or control.

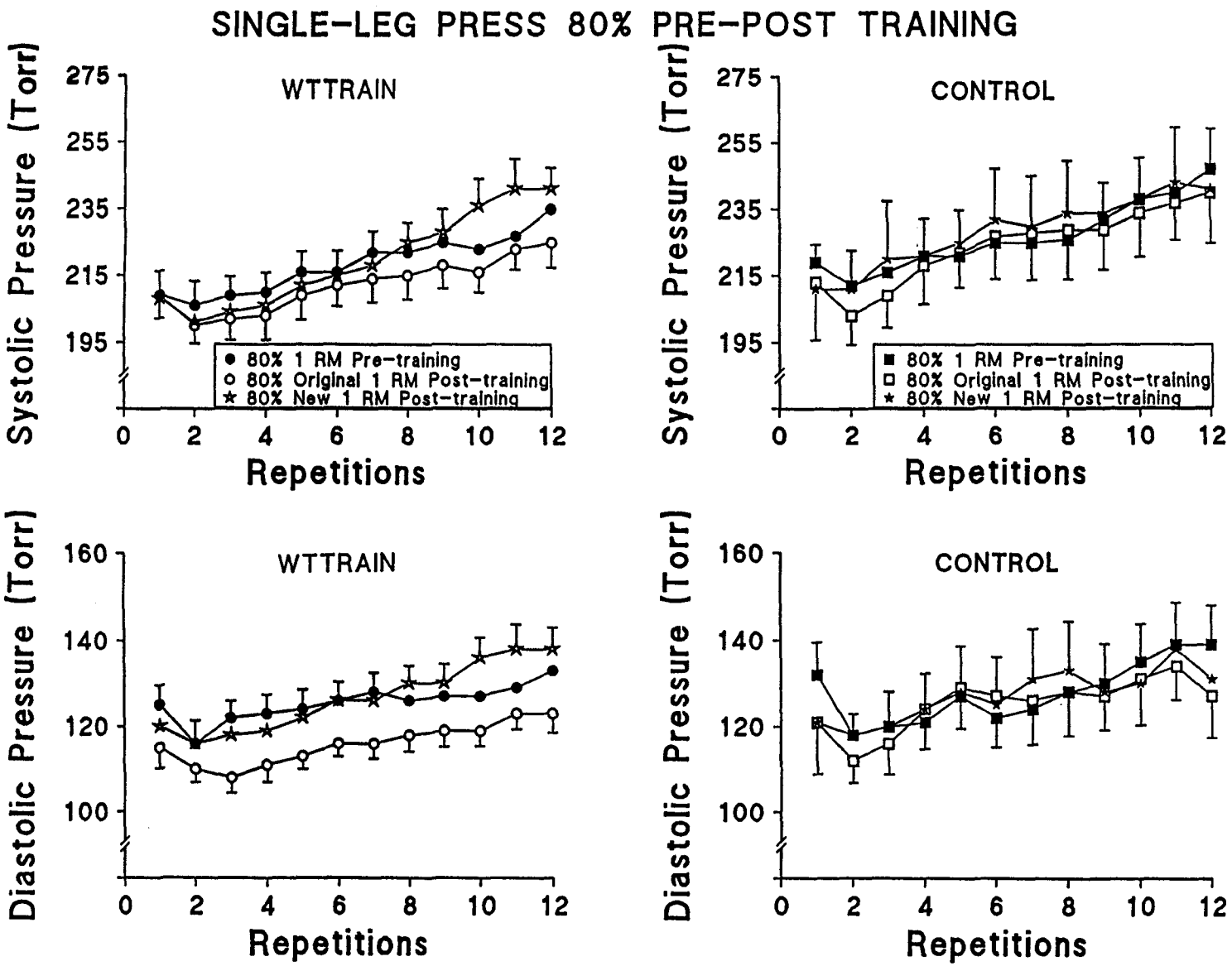

SINGLE-LEG PRESS 80% PRE-POST TRAINING
WTTRAIN
CONTROL
Systolic Pressure (Torr)
Diastolic Pressure (Torr)
Repetitions
275
255
235
215
195
160
140
120
100
0
2
4
6
8
10
12
● 80% 1 RM Pre-training
○ 80% Original 1 RM Post-training
☆ 80% New 1 RM Post-training
■ 80% 1 RM Pre-training
□ 80% Original 1 RM Post-training
★ 80% New 1 RM Post-training

Figure 11. Systolic and diastolic blood pressures (means ± SE) during 10 repetitions of single-arm curl at 70 % of 1 RM, pre- and post-(refer to legend) 10 weeks of weight-training or control.

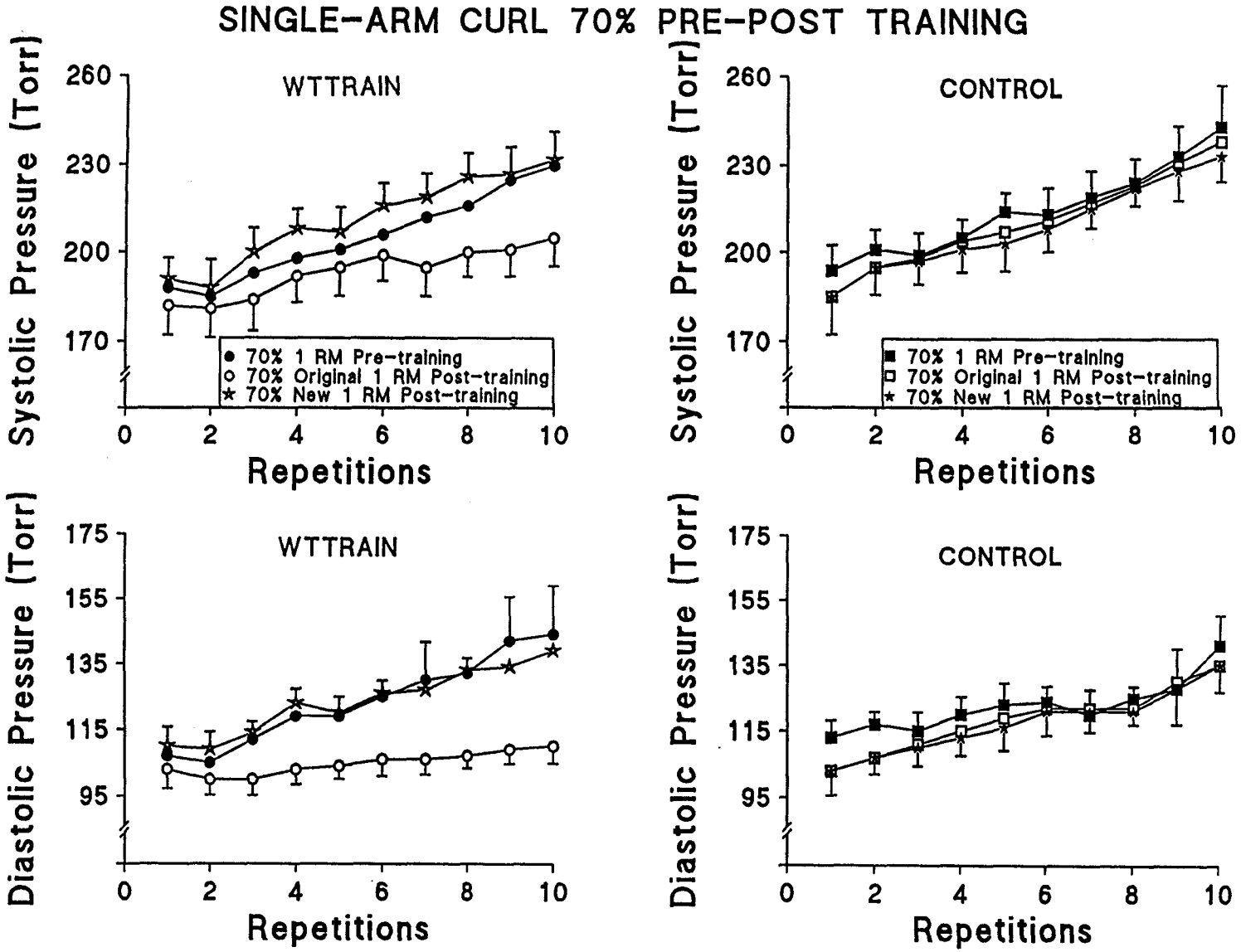
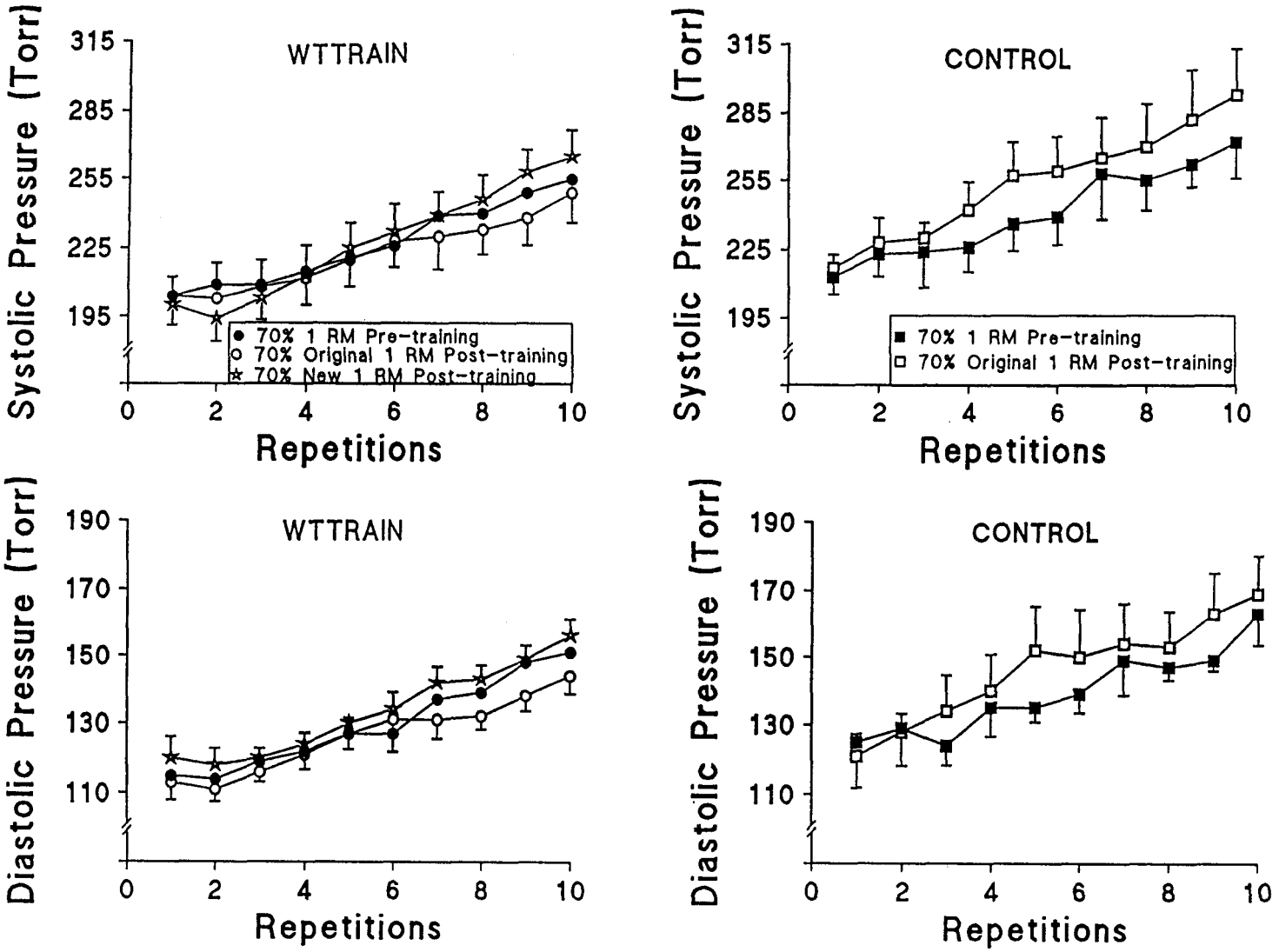

SINGLE-ARM CURL 70% PRE-POST TRAINING
WTTRAIN
CONTROL
Systolic Pressure (Torr)
Diastolic Pressure (Torr)
260
230
200
170
175
155
135
115
95
0
2
4
6
8
10
Repetitions
● 70% 1 RM Pre-training
○ 70% Original 1 RM Post-training
★ 70% New 1 RM Post-training
■ 70% 1 RM Pre-training
□ 70% Original 1 RM Post-training
★ 70% New 1 RM Post-training

Figure 12. Systolic and diastolic blood pressures (means ± SE) during 10 repetitions of single-arm military press at 70 % of 1 RM, pre-and post- (refer to legend) 10 weeks of weight-training or control.

SINGLE-ARM MILITARY 70% PRE-POST TRAINING



254.0 ± 14.5 Torr). The same overall values for the wttrain group were lower, but not significantly different (227.0 ± 9.6 to 223.0 ± 11.3 Torr; Figure 12).

3.3.2.2 Diastolic Blood Pressure

Mean maximal diastolic pressures during the SAC and SAMP were reduced (3-way interaction, $p < 0.001$ and $p < 0.007$; respectively) following training (overall reduction from 147.0 ± 10.4 to 127.0 ± 5.3 Torr) with no significant changes in the control group (Figures 11, 12). Training also resulted in significant reductions (3-way interaction, $p < 0.001$) in peak DBP in each lift after the 2nd repetition of the SAC (overall decrease repetition 3-10: 128.0 ± 11.0 to 105.0 ± 4.5 Torr or 17.5 per cent) with significantly lower ($p < 0.001$) values only during lifts one and two in the control group (Figure 11). In addition, the DBP response during SAMP was significantly attenuated (3-way interaction, $p < 0.007$) in each lift after repetition six (overall decrease repetitions 7-10: 144.0 ± 5.7 to 136.0 ± 4.8 Torr), yet the control group generated significantly higher pressures for repetitions 3, 5, 6, 8, 9 and 10 (Figure 12).

The mean maximal diastolic blood pressures during the SLP and DLP at 80% pre-training 1 RM were attenuated after training (overall decrease from 137.0 ± 6.3 to 128.0 ± 5.5 Torr)), but the differences were not significant (Figures 9, 10). The peak diastolic blood pressure in each lift of the

SLP was insignificantly lower after training (overall reduction from 125.0 ± 5.1 to 116.0 ± 3.7 Torr or a 7.6 per cent; Figure 10) and a similar nonsignificant trend emerged for the DLP (Figure 9). There were no significant diastolic blood pressure changes in the SLP or DLP exercises in the control group (Figures 9, 10).

3.3.2.3 Mean Arterial Pressure

Mean arterial pressure after training was lower in each weightlifting exercise, but the decrease was only significant during DLP (154.0 ± 5.0 to 147.0 ± 5.0 Torr, $p < 0.021$) at 80% of initial 1 RM (Figure 13). The control group demonstrated a higher mean arterial pressure for SAMP, SLP and DLP, but a lower response in the SAC (148.0 ± 4.6 to 142.0 ± 5.3 Torr). The control group changes were not significant (Figure 13).

3.3.2.4 Heart Rate

Training did not significantly decrease the heart rate response in any of the weightlifting exercises, but in the wttrain group there was a trend towards a lower heart rate for the DLP (overall 102.0 ± 5.2 to 97.0 ± 4.4 bpm, equivalent to a 4.7 per cent reduction) and SLP (98.0 ± 5.1 to 93.0 ± 4.7 bpm or a 4.9 per cent decrease) at 80% initial 1 RM, with no significant changes in either exercise for the control group (Figures 14, 15). Although training did not result in any

Figure 13. Mean arterial pressure (means ± SE) during 12 repetitions of single- and double leg press exercises at 80 % of 1 RM and 10 repetitions of single-arm curl and single-arm military press at 70 % of 1 RM, pre- and post (refer to legend) 10 weeks of weight-training or control. * $P < 0.05$.

MEAN ARTERIAL PRESSURE PRE-POST TRAINING

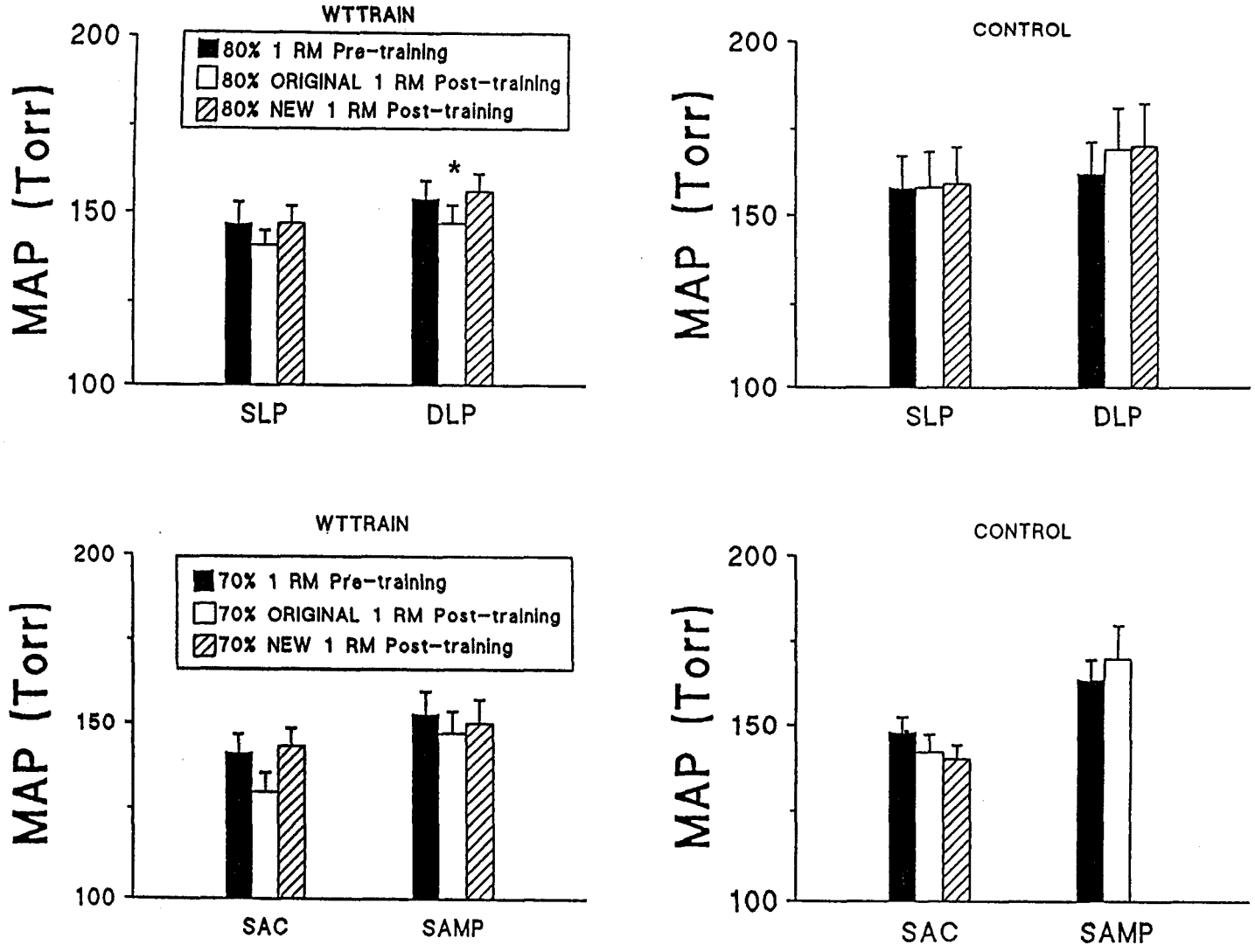
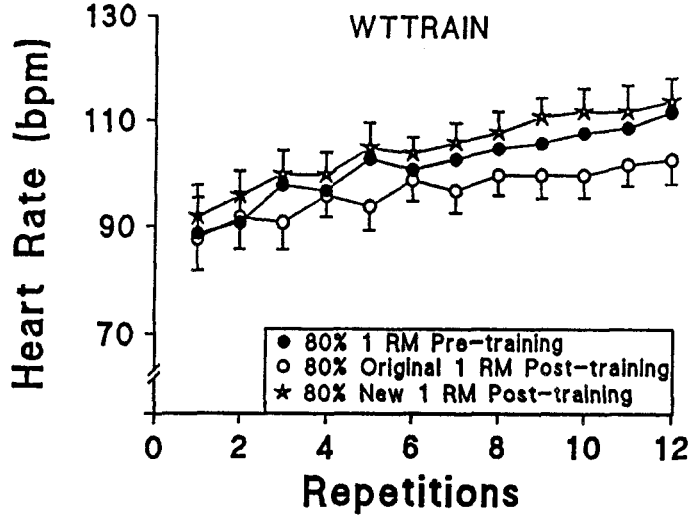
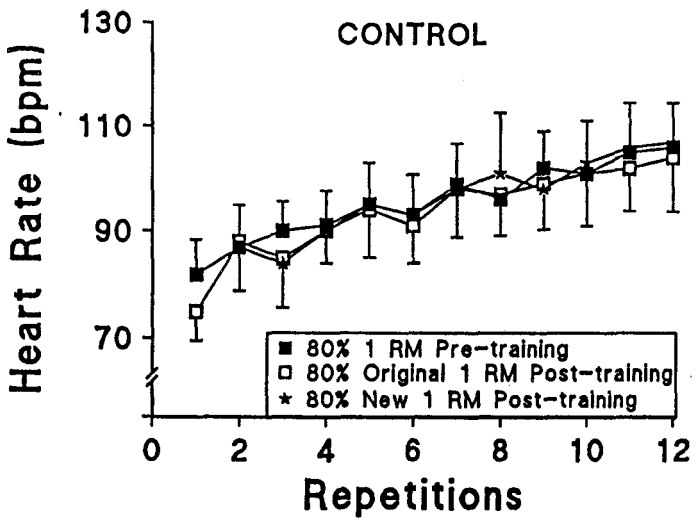
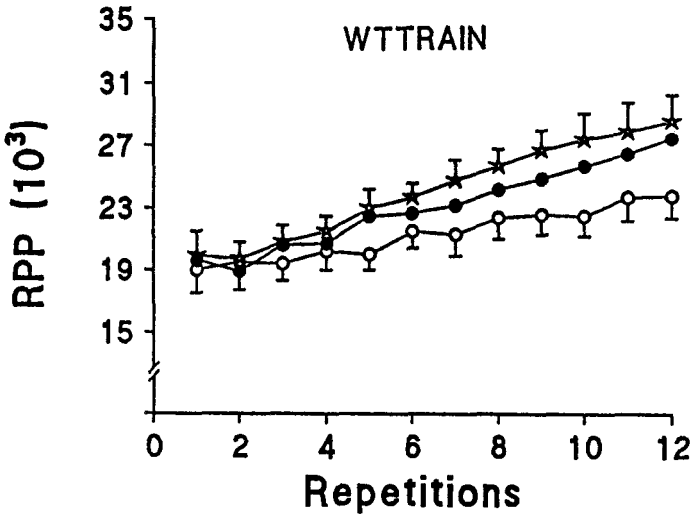


Figure 14. Heart rate and rate-pressure product (means ± SE) during 12 repetitions of double-leg press at 80 % of 1 RM, pre- and post- (refer to legend) 10 weeks of weight-training or control.

DOUBLE-LEG PRESS 80% PRE-POST TRAINING







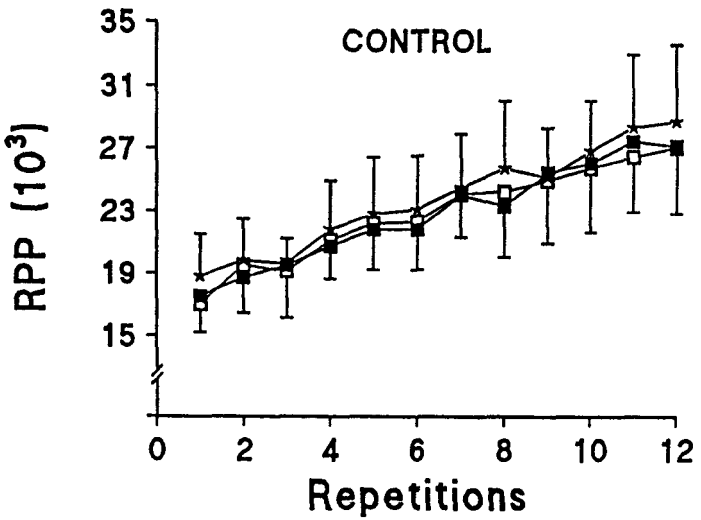
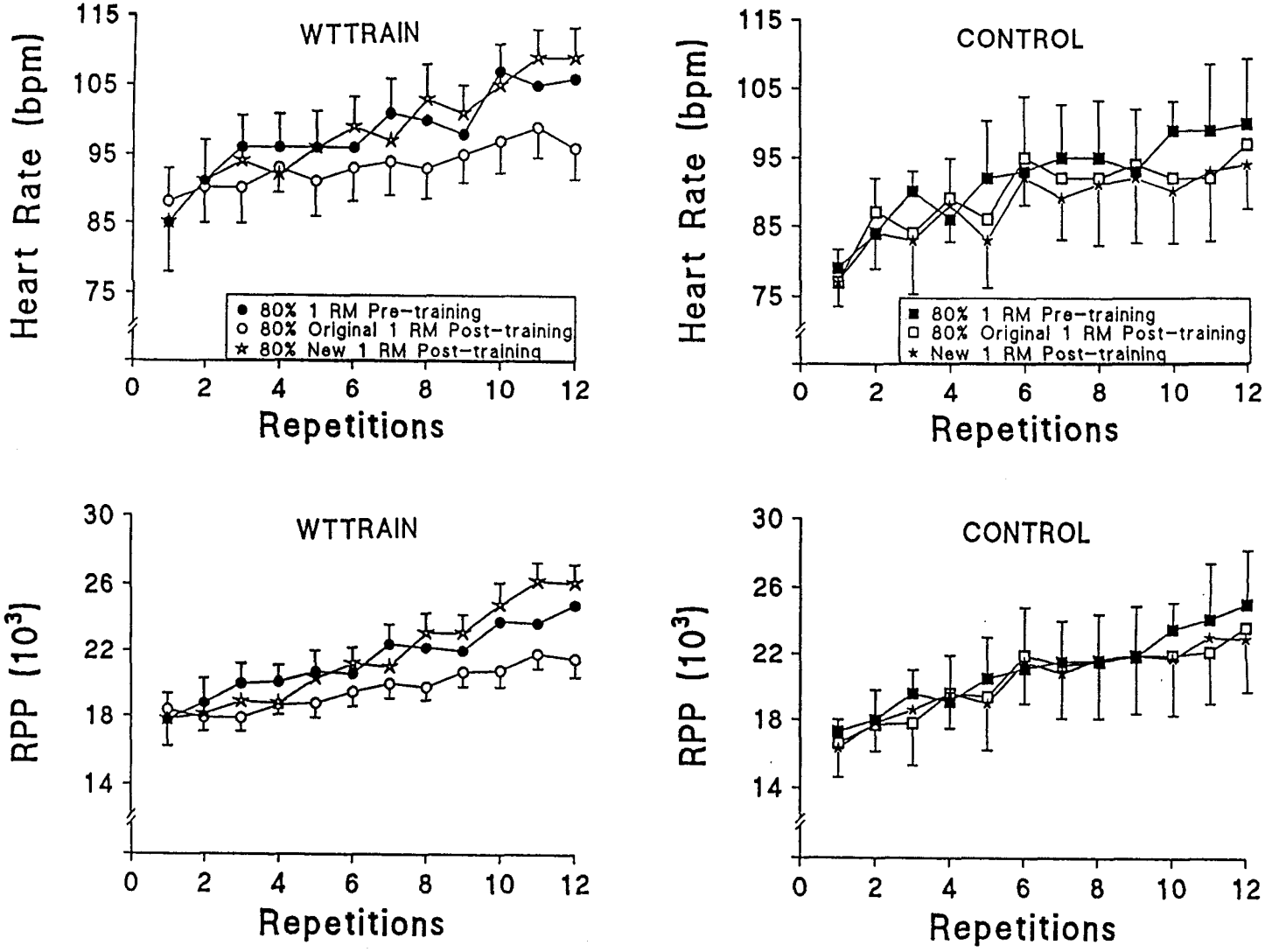


Figure 15. Heart rate and rate-pressure product (means ± SE) during 12 repetitions of single-leg press at 80 % of 1 RM, pre- and post- (refer to legend) 10 weeks of weight-training or control.

SINGLE-LEG PRESS 80% PRE-POST TRAINING



statistically significant changes in the SAC heart rate response, the wttrain group showed a reduction of 6.1 per cent (96.0 ± 6.1 to 90.0 ± 6.0 bpm) in each lift beyond the 4th repetition, and in the control group a 2.4 per cent decrease was noted (Figure 16). The overall heart rate values for the SAMP following training were higher, but not significantly, in both the wttrain and control groups (Figure 17).

3.3.2.5 Rate-Pressure Product

The mean maximal rate-pressure product during the lifting of identical absolute loads was attenuated in each exercise after training (Figures 14, 15, 16, 17), but the only significant difference (3-way interaction, $p < 0.041$) was during SAC (22.7 ± 2.2 to 19.1 ± 1.4 equivalent to a 15 per cent reduction), with no significant changes in the control group (Figure 16). Furthermore, the peak values in each lift beyond the 2nd repetition for the SAC, SLP and DLP (overall beyond repetition 2: 22.0 ± 1.6 to 19.8 ± 1.2) were lower, with significant differences only after the 5th repetition of SAC (overall decrease from 21.2 ± 2.3 to 18.0 ± 1.5 or 15.1 per cent, 3-way interaction, $p < 0.041$; Figure 16) lifting at 70% of pre-training 1 RM. There were no significant changes in the control group for any of the four weightlifting exercises (Figures 14, 15, 16, 17).

Figure 16. Heart rate and rate-pressure product (means ± SE) during 10 repetitions of single-arm curl at 70 % of 1 RM, pre- and post- (refer to legend) 10 weeks of weight-training or control.

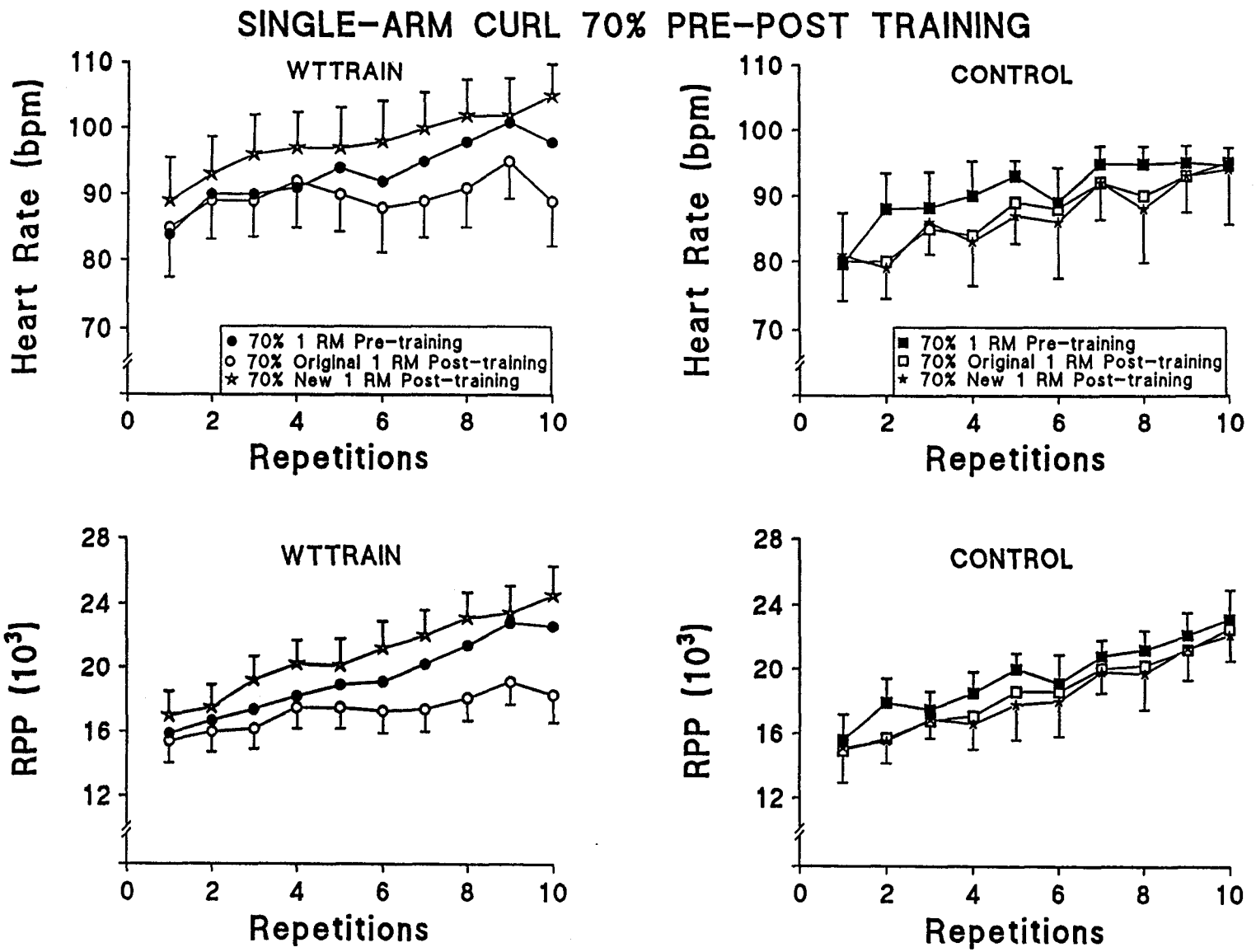
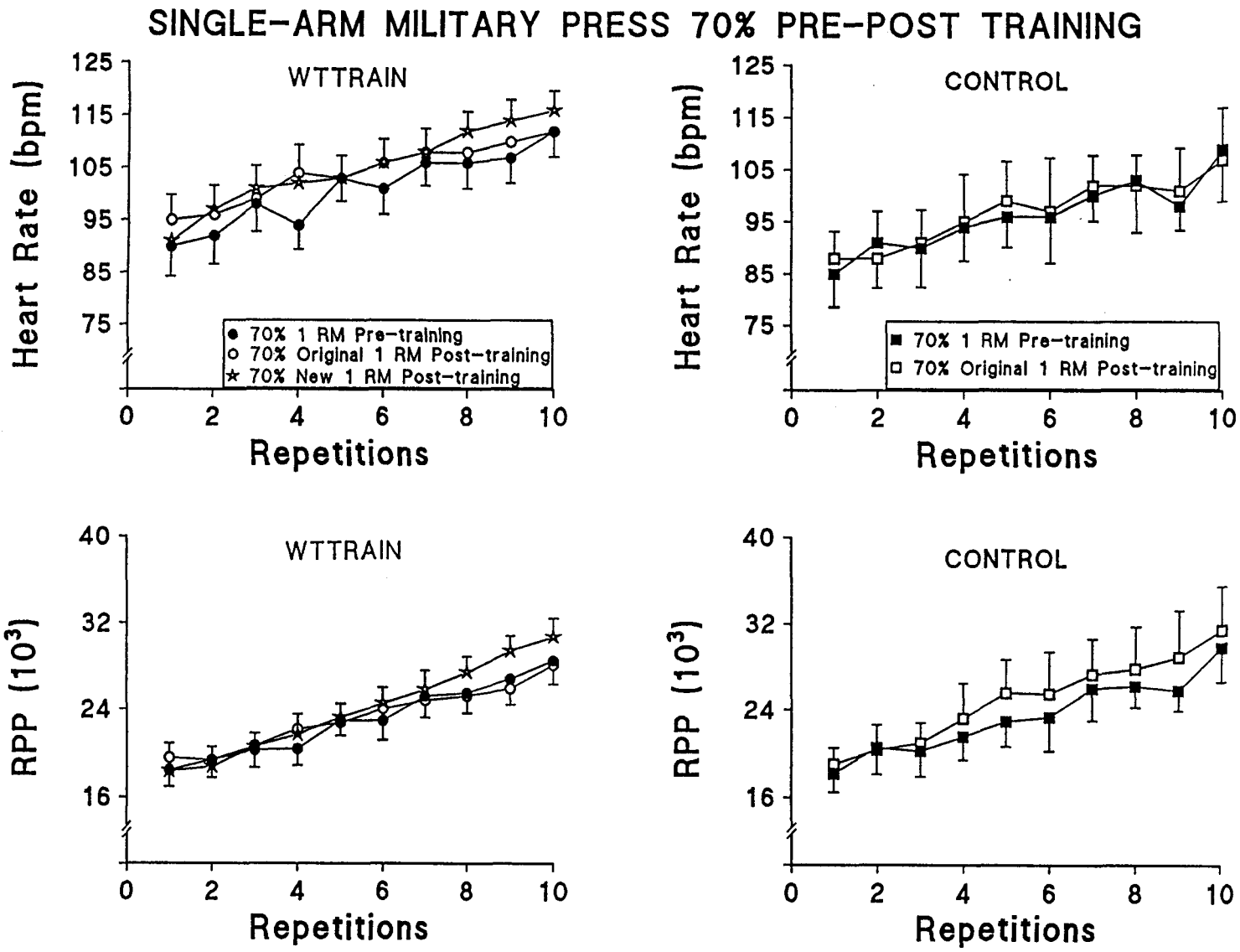

SINGLE-ARM CURL 70% PRE-POST TRAINING
WTTRAIN
CONTROL
Heart Rate (bpm)
RPP (10³)
Repetitions
● 70% 1 RM Pre-training
○ 70% Original 1 RM Post-training
☆ 70% New 1 RM Post-training
■ 70% 1 RM Pre-training
□ 70% Original 1 RM Post-training
★ 70% New 1 RM Post-training

Figure 17. Heart rate and rate-pressure product (means ± SE) during 10 repetitions of single-arm military press at 70 % of 1 RM, pre-and post- (refer to legend) 10 weeks of weight-training or control.


SINGLE-ARM MILITARY PRESS 70% PRE-POST TRAINING
WTTRAIN
CONTROL
Heart Rate (bpm)
RPP (10³)
Repetitions
70% 1 RM Pre-training
70% Original 1 RM Post-training
70% New 1 RM Post-training

3.3.2.6 Effect of Repetitions

In all four weightlifting exercises the arterial pressures, heart rate and rate-pressure product values increased with successive repetitions ($p < 0.001$; Figures 9-12, 14-17).

3.3.3 During Lifting at 70 and 80% of the Post-Training 1 RM

In general, the heart rate and arterial blood pressure responses during lifting of the new 1 RMs were similar to those generated when subjects initially lifted 70 and 80% of their pre-training 1 RMs. This included significant ($p < 0.001$) increases in systolic and diastolic blood pressures, heart rate and rate-pressure product with successive repetitions, maximal values, and the peak values in each lift (Figures 9-12, 14-17). However, the systolic blood pressure response during the final two lifts (overall increase from 252.0 ± 10.2 to 262.0 ± 11.1; Torr; Figure 12) and the rate-pressure product elicited in the 8th, 9th, and 10th repetitions (overall increase 26.9 ± 1.8 to 29.2 ± 1.5; Figure 17) of the SAMP were significantly (2-way interaction, $p < 0.001$) higher in the wttrain group. When subjects performed the SLP at 80% post-training 1 RM the systolic ($p < 0.018$) and diastolic blood pressure ($p < 0.015$) response (Figure 10) for repetitions 10 and 11 and the rate-pressure product (Figure

15) for lift 11 ($p < 0.038$) was also significantly higher in the wttrain group.

3.3.4 During Handgrip Dynamometry at 50% of the Pre Training MVC

Training did not result in significant changes in the SBP, DBP, MAP, HR and RPP values for the handgrip exercise at 50% of the original MVC (Figure 18). There were no significant differences in the control group in any of the respective responses (Figure 18).

3.3.5 During Handgrip Dynamometry at 50% of the Post-Training MVC

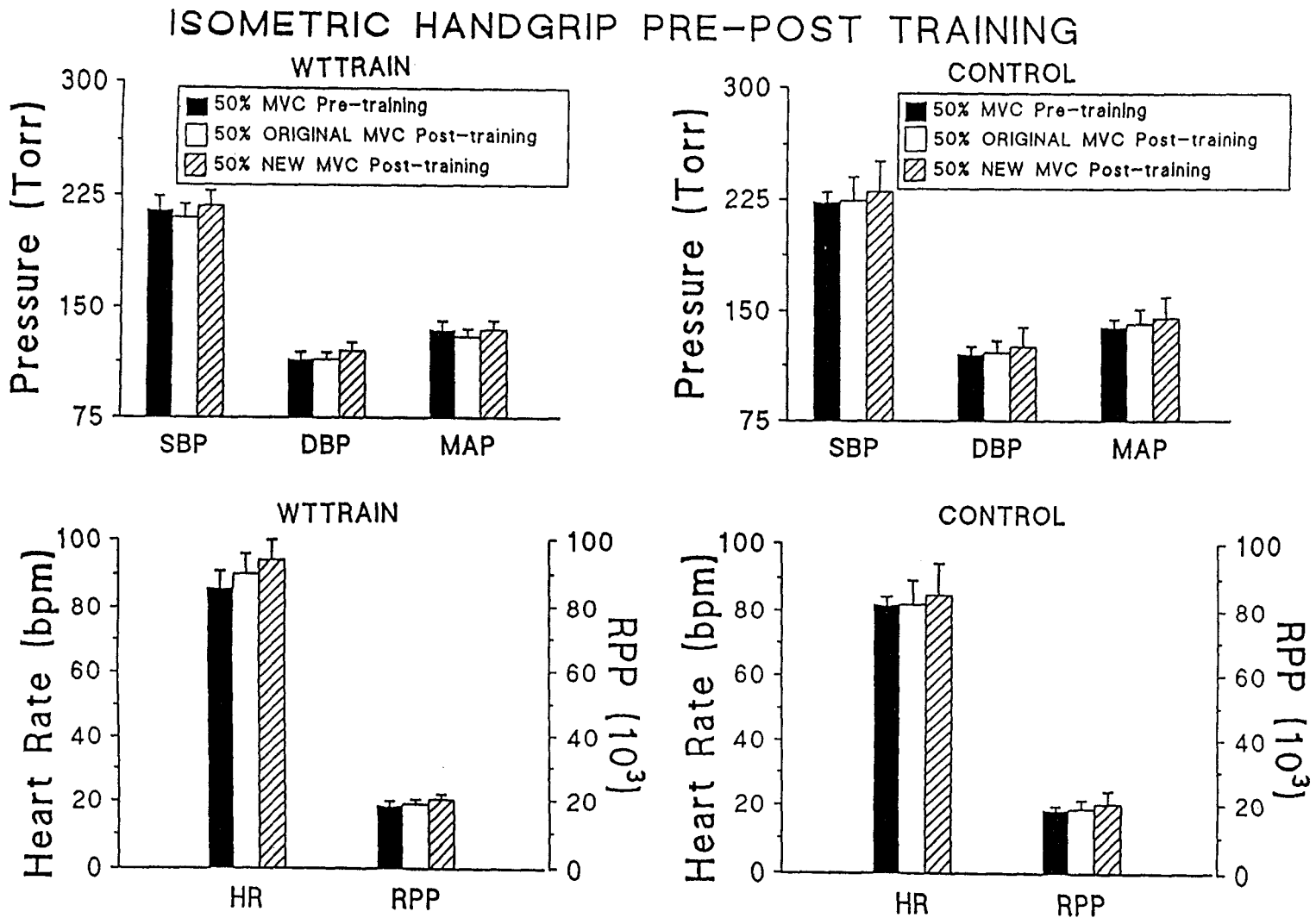
When subjects performed handgrip dynamometry at 50% of their post-testing MVC the arterial pressure, HR and RPP responses were not significantly different from those elicited during pre-testing (Figure 18).

3.3.6 During 4 Minutes of Treadmill Walking at 3.0 mph, 8% Grade

3.3.6.1 Effect of Time

Heart rate , rate-pressure product and arterial pressures increased significantly ($p < 0.001$) from the first to the fourth minute. Training did not result in significant

Figure 18. Arterial pressures, heart rate and rate-pressure product (means ± SE) during one minute of isometric handgrip at 50 % MVC, pre- and post- (refer to legend) 10 weeks of weight-training or control.


ISOMETRIC HANDGRIP PRE-POST TRAINING
WTTRAIN
CONTROL
50% MVC Pre-training
50% ORIGINAL MVC Post-training
50% NEW MVC Post-training
Pressure (Torr)
300
225
150
75
SBP
DBP
MAP
Heart Rate (bpm)
RPP (10^3)
100
80
60
40
20
0
HR
RPP

decreases in arterial blood pressure or heart rate, but there were consistent trends for lowering during each minute of the exercise in the wttrain group, and nonsignificant increases in the control group (Figures 19, 20, 21).

3.3.6.2 Systolic Blood Pressure

The systolic blood pressure decreased overall by 3.1 per cent in the wttrain group and was higher by 6.4 per cent in the control group (223.0 ± 8.4 to 216.0 ± 7.7 Torr; 241.0 ± 14.0 to 256.0 ± 22.3 Torr), but the differences were not significant (Figure 19).

3.3.6.3 Diastolic Blood Pressure

Although training did not result in any statistically significant change in the diastolic blood pressure the wttrain group response was 4.7 per cent lower (overall reduction from 102.0 ± 3.3 to 97.0 ± 2.8 Torr) and in the control group a 9.2 per cent increase in pressure was noted (102.0 ± 5.4 to 112.0 ± 10.6 Torr) (Figure 19).

3.3.6.4 Mean Arterial Pressure

Mean arterial pressure following training was attenuated (overall reduction from minutes 1-4: 125.0 ± 5.2 to 119.0 ± 3.9 or 4.3 per cent; Figure 20) at each minute but the decreases were not significant. In contrast, there was a nonsignificant increase in the mean arterial pressure in the

Figure 19. Systolic and diastolic blood pressures (means ± SE) during 4 minutes of treadmill walking at 3.0 mph, 8 % grade, pre- and post- (refer to legend) weight-training and control.

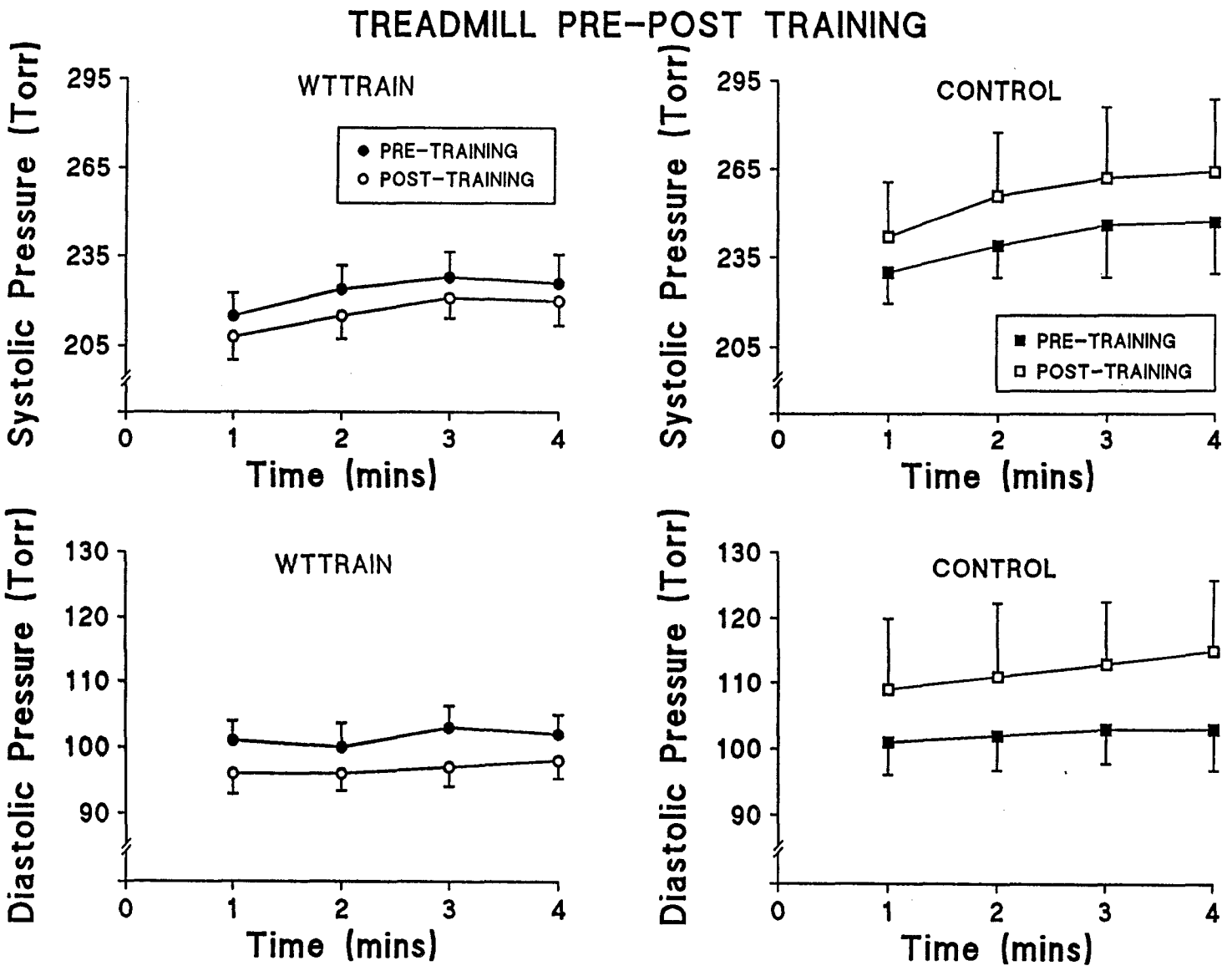

TREADMILL PRE-POST TRAINING
WTTRAIN
CONTROL
Systolic Pressure (Torr)
Diastolic Pressure (Torr)
295
265
235
205
130
120
110
100
90
0
1
2
3
4
Time (mins)
PRE-TRAINING
POST-TRAINING

Figure 20. Mean arterial pressure (means ± SE) during 4 minutes of treadmill walking at 3.0 mph, 8 % grade, and 10 minutes of treadmill walking at 2.5 mph, 0 % grade, carrying 20 pounds between minutes 4-6, and 30 pounds between minutes 8-10, pre-and post- (refer to legend) 10 weeks of weight-training or control.

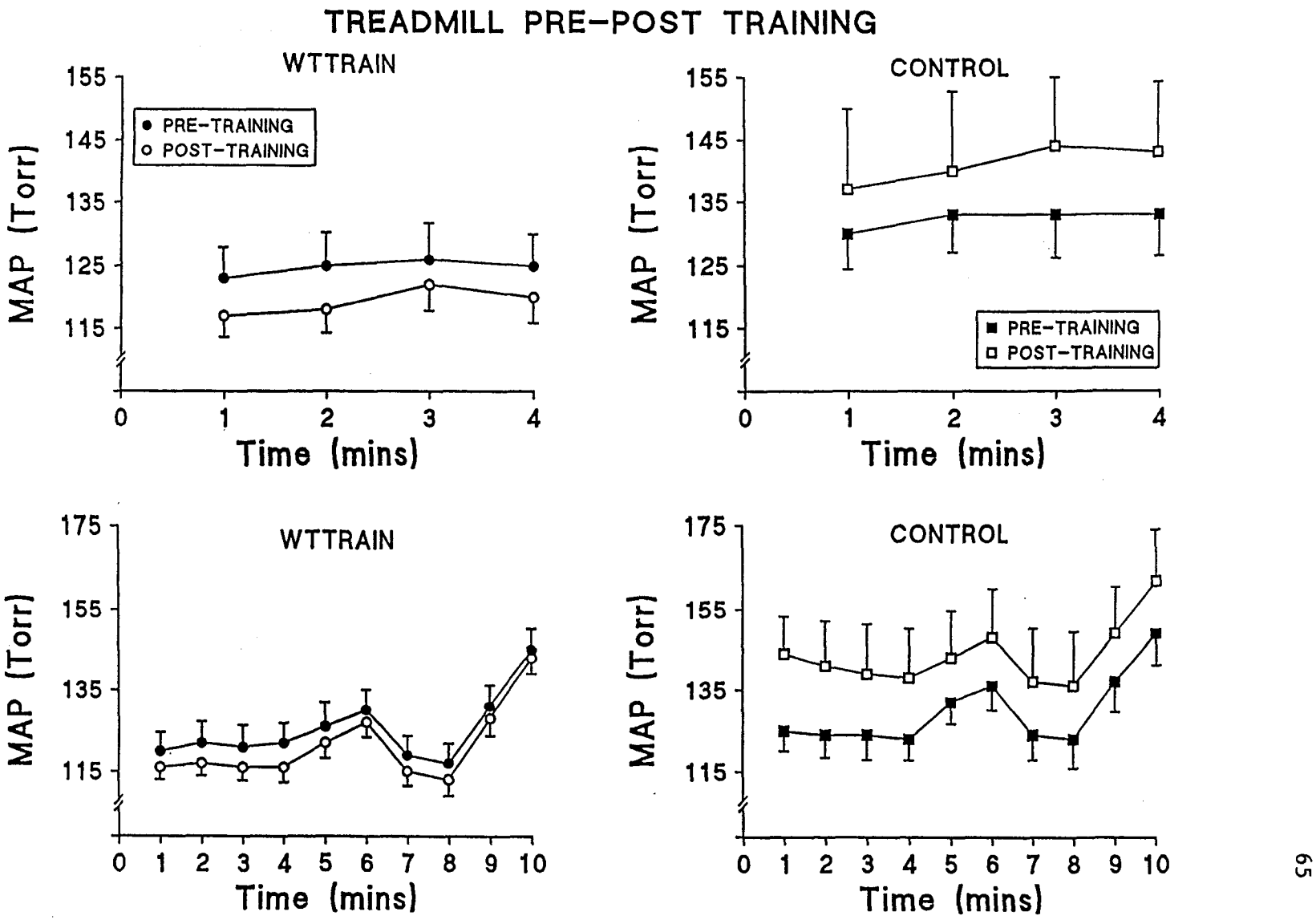
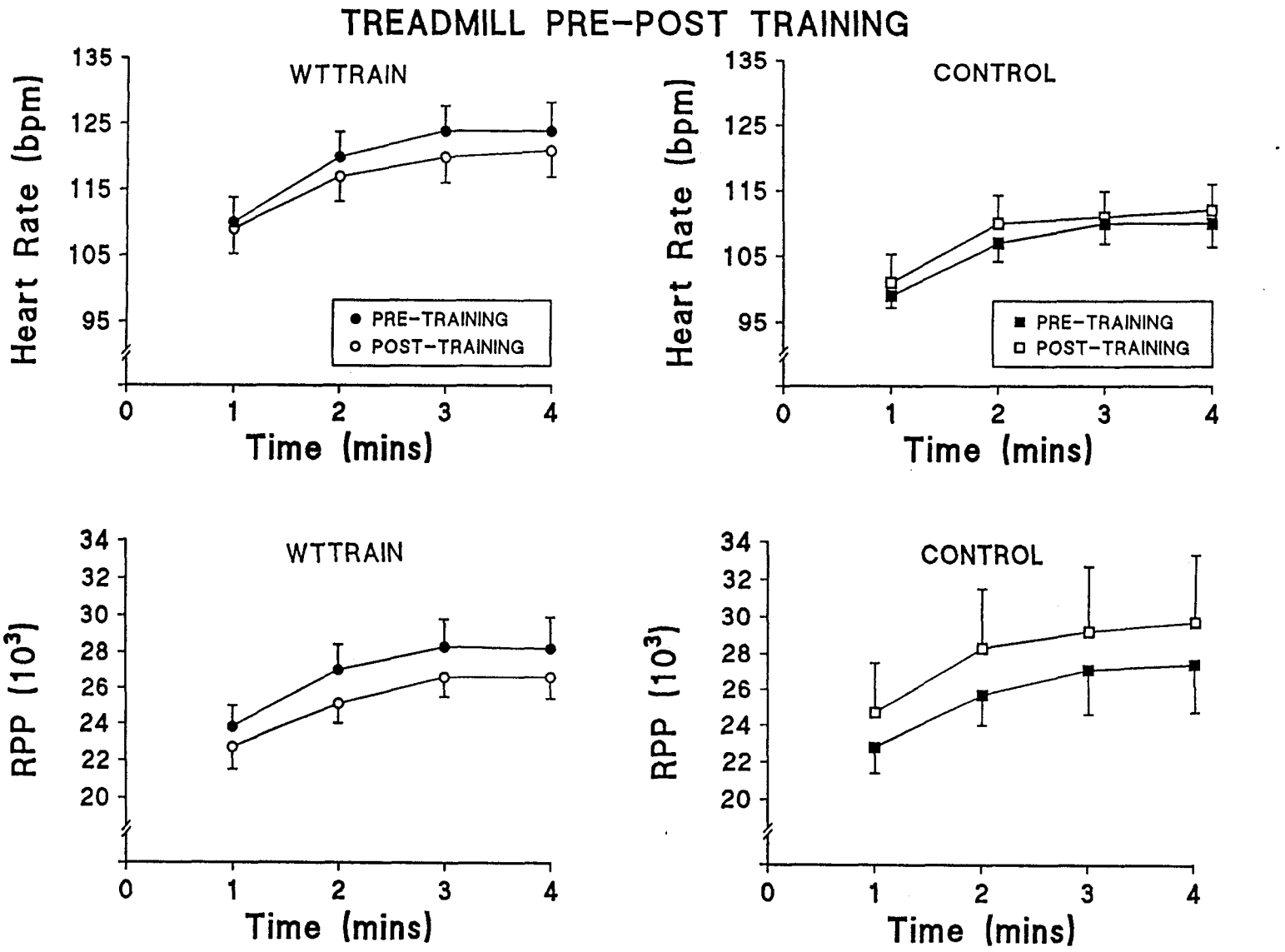

TREADMILL PRE-POST TRAINING
WTTRAIN
CONTROL
PRE-TRAINING
POST-TRAINING
MAP (Torr)
155
145
135
125
115
0 1 2 3 4
Time (mins)
WTTRAIN
CONTROL
175
155
135
115
0 1 2 3 4 5 6 7 8 9 10
Time (mins)

Figure 21. Heart rate and rate-pressure product (means ± SE) during 4 minutes of treadmill walking at 3.0 mph, 8 % grade, pre- and post- (refer to legend) 10 weeks of weight-training or control.


TREADMILL PRE-POST TRAINING
WTTRAIN
CONTROL
Heart Rate (bpm)
RPP (10³)
Time (mins)
PRE-TRAINING
POST-TRAINING
135
125
115
105
95
34
32
30
28
26
24
22
20
0
1
2
3
4

control group of 6.5 per cent (132.0 ± 6.2 to 141.0 ± 12.7 Torr; Figure 20).

3.3.6.5 Heart Rate

Training had the least influence on the heart rate response. The wttrain group only showed a 2.6 per cent decrease overall from 120.0 ± 4.0 to 117.0 ± 3.9 bpm; and in the control group there was a 1.0 per cent increase (Figure 21).

3.3.6.6 Rate-Pressure Product

After training the rate-pressure product was attenuated in each minute of the exercise with an overall nonsignificant reduction of 6 per cent (26.8 ± 1.5 to 25.2 ± 1.2); whereas in the control group it was 8.7 per cent higher (25.8 ± 2.1 to 28.0 ± 3.3) (Figure 21).

3.3.7 During Treadmill Walking at 2.5 mph carrying 20 pounds between minutes 4-6, and 30 pounds between minutes 8-10

3.3.7.1 Effect of Time

In general, the arterial blood pressure and heart rate responses were unchanged during four minutes of horizontal treadmill walking at 2.5 mph, increased significantly ($p < 0.001$) when subjects carried a 20 pound load, decreased

significantly when the load was released and increased significantly ($p < 0.001$) again when carrying a 30 pound load. Similar to the four minutes of inclined walking, the systolic, diastolic, mean arterial blood pressure and heart rate values in the wttrain group were consistently lower after training compared with higher responses in the control group (Figures 20, 22, 23).

3.3.7.2 Systolic Blood Pressure

Training resulted in nonsignificant overall decreases in the systolic blood pressure response for minutes 1-4 (201.0 ± 8.0 to 192.0 ± 6.1 Torr), 4-6 (214.0 ± 7.7 to 207.0 ± 6.7 Torr), and 6-8 (202.0 ± 6.2 to 197.0 ± 7.1 Torr), and in the control group significant (2-way interaction, $p < 0.05$) overall increases in pressure were found for the same respective measurements (Figure 22).

After training the systolic blood pressure was significantly (3-way interaction, $p < 0.033$) attenuated during minutes 8-9 (223.0 ± 8.6 to 218.0 ± 8.0 Torr), and 9-10 (240.0 ± 7.9 to 236.0 ± 7.1 Torr) when subjects carried the 30 pound load, but the control group showed a significant increase in pressure for the same respective measurements (232.0 ± 12.9 to 253.0 ± 17.2 Torr; 249.0 ± 13.7 to 264.0 ± 18.0 Torr) (Figure 22).

Figure 22. Systolic and diastolic blood pressures (means ± SE) during 10 minutes of treadmill walking at 2.5 mph, 0 % grade, carrying 20 pounds between minutes 4-6, and 30 pounds between minutes 8-10, pre- and post- (refer to legend) 10 weeks of weight-training or control.

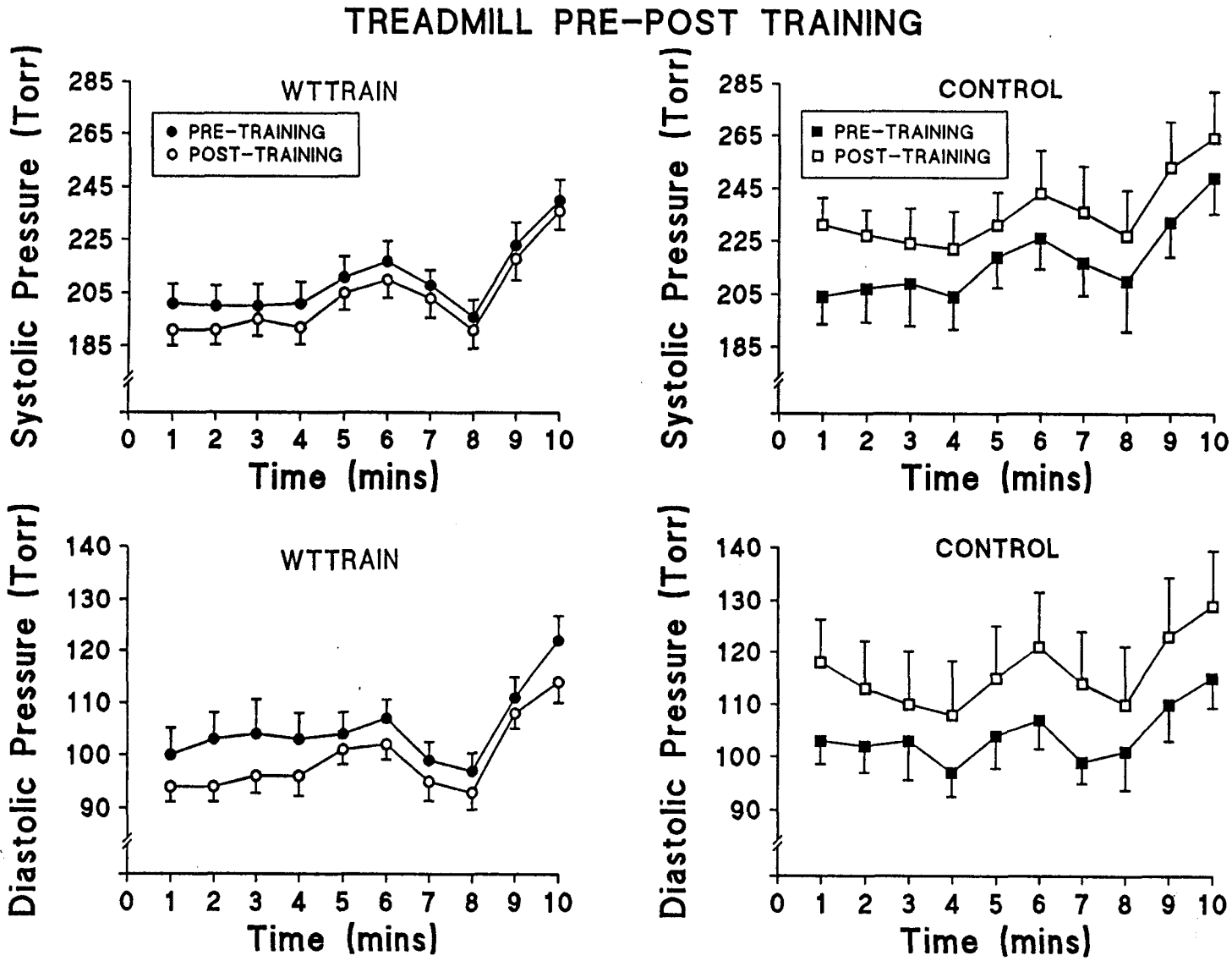
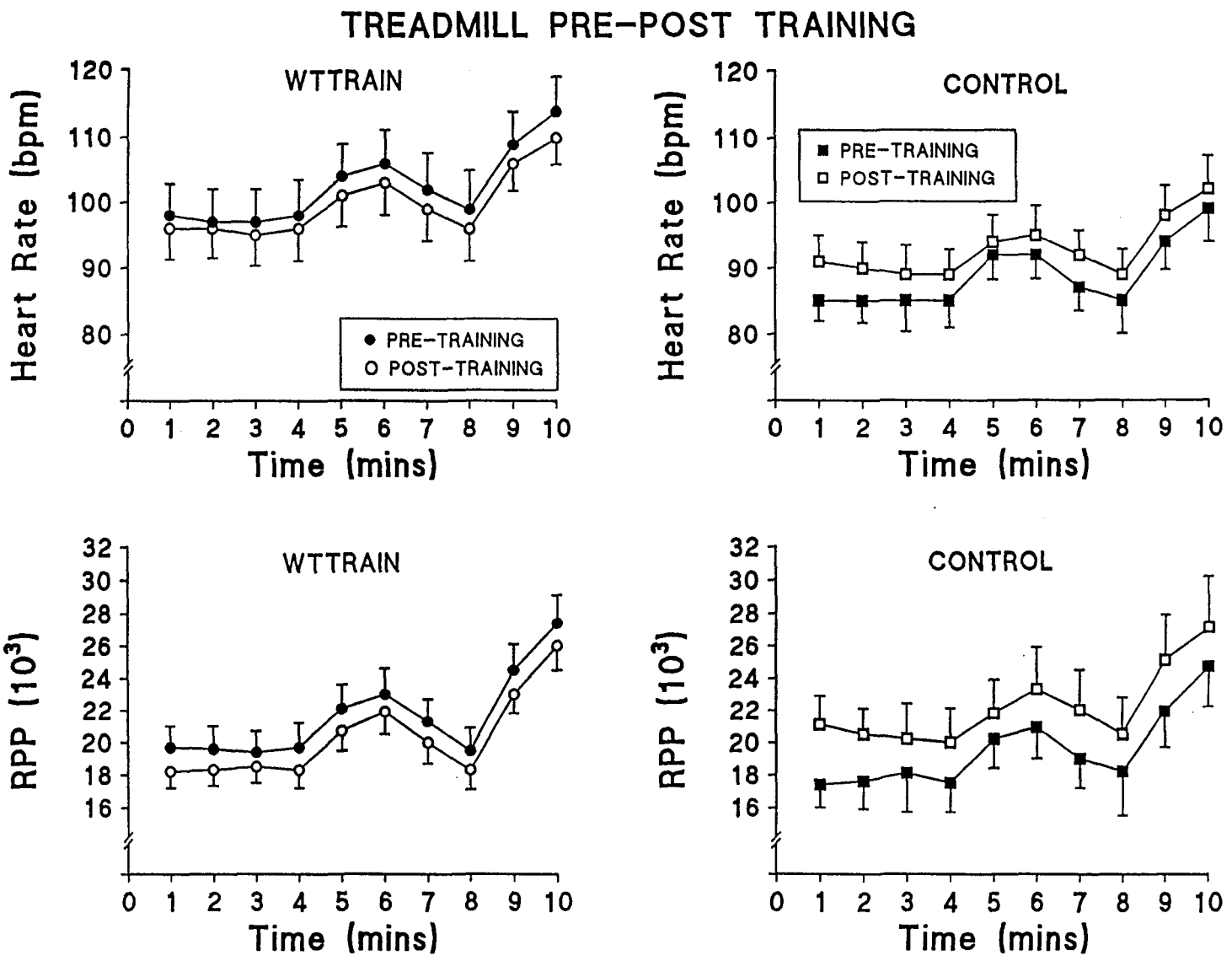

TREADMILL PRE-POST TRAINING
WTTRAIN
PRE-TRAINING
POST-TRAINING
Systolic Pressure (Torr)
285
265
245
225
205
185
0 1 2 3 4 5 6 7 8 9 10
Time (mins)
CONTROL
PRE-TRAINING
POST-TRAINING
Systolic Pressure (Torr)
285
265
245
225
205
185
0 1 2 3 4 5 6 7 8 9 10
Time (mins)
WTTRAIN
Diastolic Pressure (Torr)
140
130
120
110
100
90
0 1 2 3 4 5 6 7 8 9 10
Time (mins)
CONTROL
Diastolic Pressure (Torr)
140
130
120
110
100
90
0 1 2 3 4 5 6 7 8 9 10
Time (mins)

Figure 23. Heart rate and rate-pressure product (means ± SE) during 10 minutes of treadmill walking at 2.5 mph, 0 % grade, carrying 20 pounds between minutes 4-6, and 30 pounds between minutes 8-10, pre- and post- (refer to legend) 10 weeks of weight-training or control.


TREADMILL PRE-POST TRAINING
WTTRAIN
CONTROL
Heart Rate (bpm)
RPP (10³)
Time (mins)
PRE-TRAINING
POST-TRAINING
120
110
100
90
80
32
30
28
26
24
22
20
18
16
0 1 2 3 4 5 6 7 8 9 10

3.3.7.3 Diastolic Blood Pressure

The diastolic blood pressure response for minutes 1-4 in the wttrain group was 7.5 per cent lower following training (overall nonsignificant decrease from 102.0 ± 5.5 to 95.0 ± 3.1 Torr), and 11 per cent higher (2-way interaction, $p < 0.036$) overall in the control group (Figure 22).

When subjects carried 20 and 30 pound loads the diastolic blood pressure responses for the wttrain group were lower (overall decrease from 105.0 ± 3.9 to 101.0 ± 2.9 Torr; and 117.0 ± 4.4 to 111.0 ± 3.4 Torr), and increased significantly (2-way interaction, $p < 0.04$) overall in the control group (Figure 22).

3.3.7.4 Mean Arterial Pressure

The overall mean arterial pressure changes in the wttrain group were: for minutes 1-4 (121.0 ± 5.0 to 116.0 ± 3.3 Torr) the equivalent of a nonsignificant 4.1 per cent decrease; for minutes 4-6 (128.0 ± 5.4 to 124.0 ± 3.7 Torr) a nonsignificant 2.9 per cent decrease; for minutes 6-8 (118.0 ± 4.8 to 114.0 ± 3.7 Torr) a 3.6 per cent decrease that was not significant; and for minutes 8-10 (138.0 ± 5.2 to 135.0 ± 4.2 Torr) a 1.8 per cent nonsignificant decrease in pressure (Figure 20). The same measurements for the respective phases were higher in the control group, but significantly higher overall only for minutes 1-4 (2-way interaction, $p < 0.016$) (Figure 20).

3.3.7.5 Heart Rate

Heart rate, although consistently lower, was least affected by the training intervention. The greatest relative change of 3.4 per cent was not significant and was demonstrated during minutes 8-10 when subjects carried a 30 pound load (112.0 ± 5.0 to 108.0 ± 4.2 bpm; Figure 23). The opposite HR response occurred in the control group (96.0 ± 4.7 to 100.0 ± 4.9 bpm; Figure 23), but the differences were insignificant.

3.3.7.6 Rate-Pressure Product

After training the rate-pressure product was significantly (3-way interaction, $p < 0.034$) attenuated for each of the first four minutes of horizontal walking at 2.5 mph (overall from 19.6 ± 1.4 to 18.3 ± 1.0; Figure 23) equivalent to a 6.6 per cent decrease. The rate-pressure product was significantly (3-way interaction, $p < 0.034$) higher (overall from 17.6 ± 1.8 to 20.4 ± 1.9 or a 15.9 per cent increase; Figure 23) for minutes 1-4 in the control group. A nonsignificant overall reduction was also found for minutes 6-8 (20.4 ± 1.4 to 19.2 ± 1.3) and minutes 8-10 (25.9 ± 1.7 to 24.5 ± 1.4) after training, whereas the control group values for the same respective measurements were significantly higher overall (18.6 ± 2.3 to 21.2 ± 2.4, $p < 0.029$ and 23.3 ± 2.4 to 26.1 ± 3.0, $p < 0.049$) (Figure 23).

3.3.8 During Stairclimbing

3.3.8.1 Effect of Flight

Arterial blood pressures, heart rate and rate-pressure product increased significantly ($p < 0.001$) from the first to the twelfth flight (Figures 24, 25, 26).

3.3.8.2 Systolic Blood Pressure

There were no significant changes following training in the systolic blood pressure response, although there was a significant overall increase of 8.7 per cent in the control group (253.8 ± 13.5 to 275.9 ± 19.5 Torr, 2-way interaction, $p < 0.037$) (Figure 24).

3.3.8.3 Diastolic Blood Pressure

Training did not result in any significant reductions in the diastolic blood pressure, but the control group again elicited consistently higher pressures (overall from 107.0 ± 5.9 to 118.0 ± 9.0 Torr) (Figure 24).

3.3.8.4 Mean Arterial Pressure

After training there was no significant change in the mean arterial pressure response in either the wttrain group or in the control group (Figure 25).

Figure 24. Systolic and diastolic pressures (means ± SE) during 12 flights of stairclimbing at a rate of 60 steps per minute, pre- and post- (refer to legend) 10 weeks of weight-training or control.

STAIRMASTER PRE-POST TRAINING

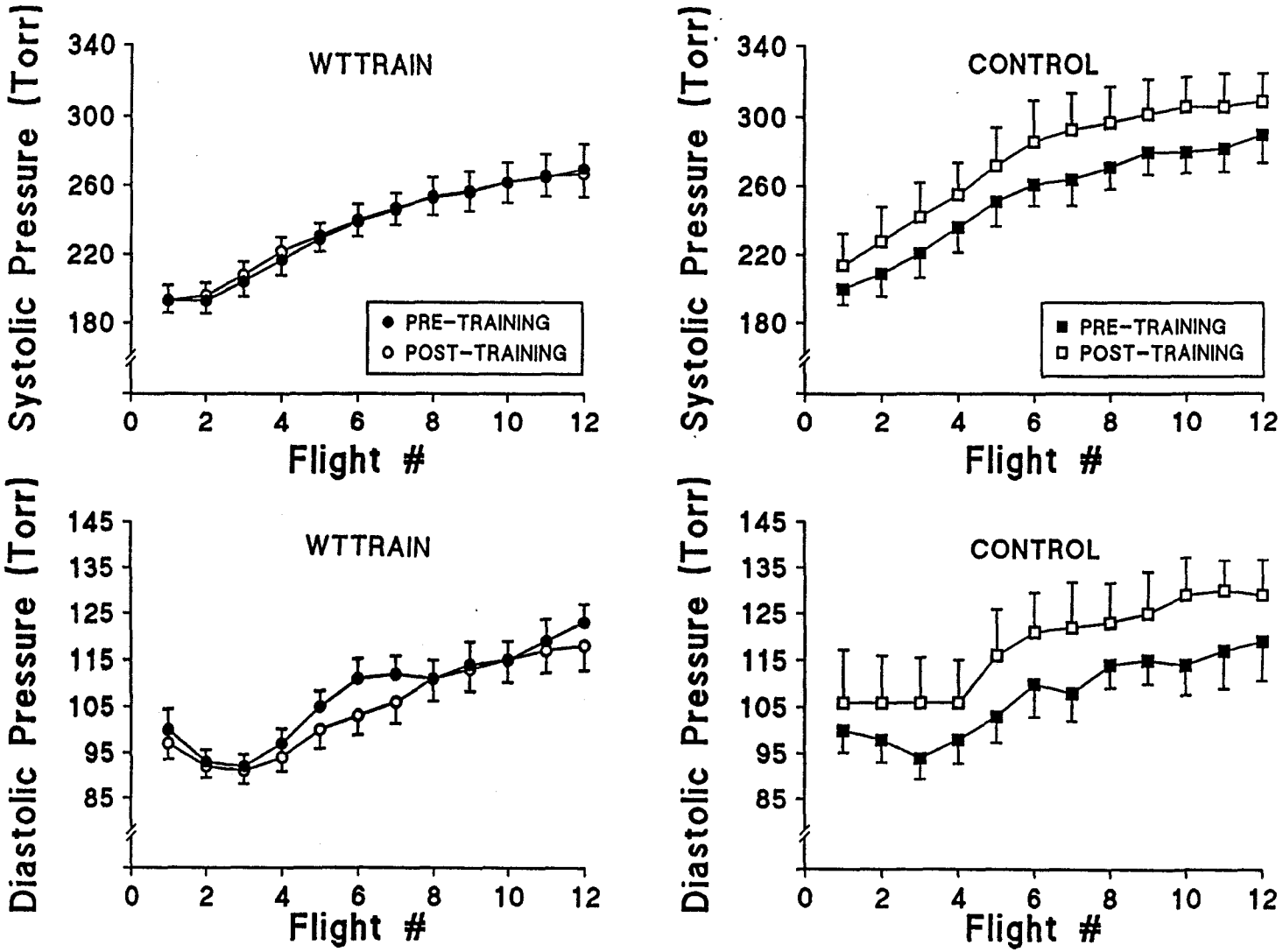


Figure 25. Mean arterial pressure (means ± SE) during 12 flights of stairclimbing at a rate of 60 steps per minute, pre- and post-(refer to legend) 10 weeks of weight-training or control.

STAIRMASTER PRE-POST TRAINING

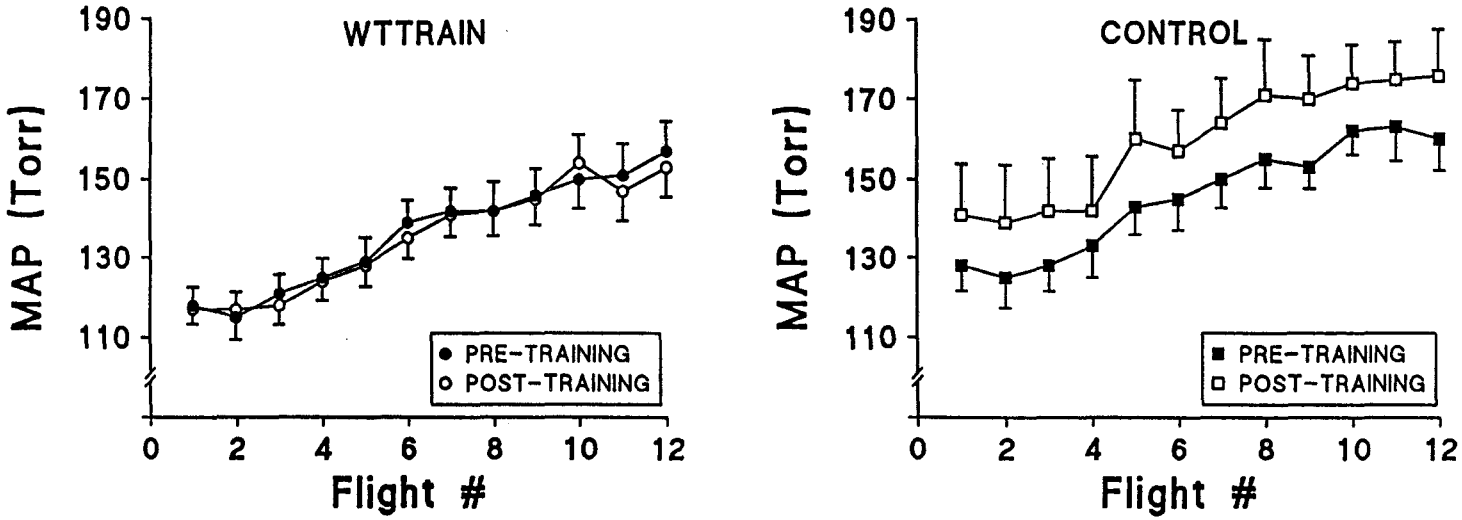
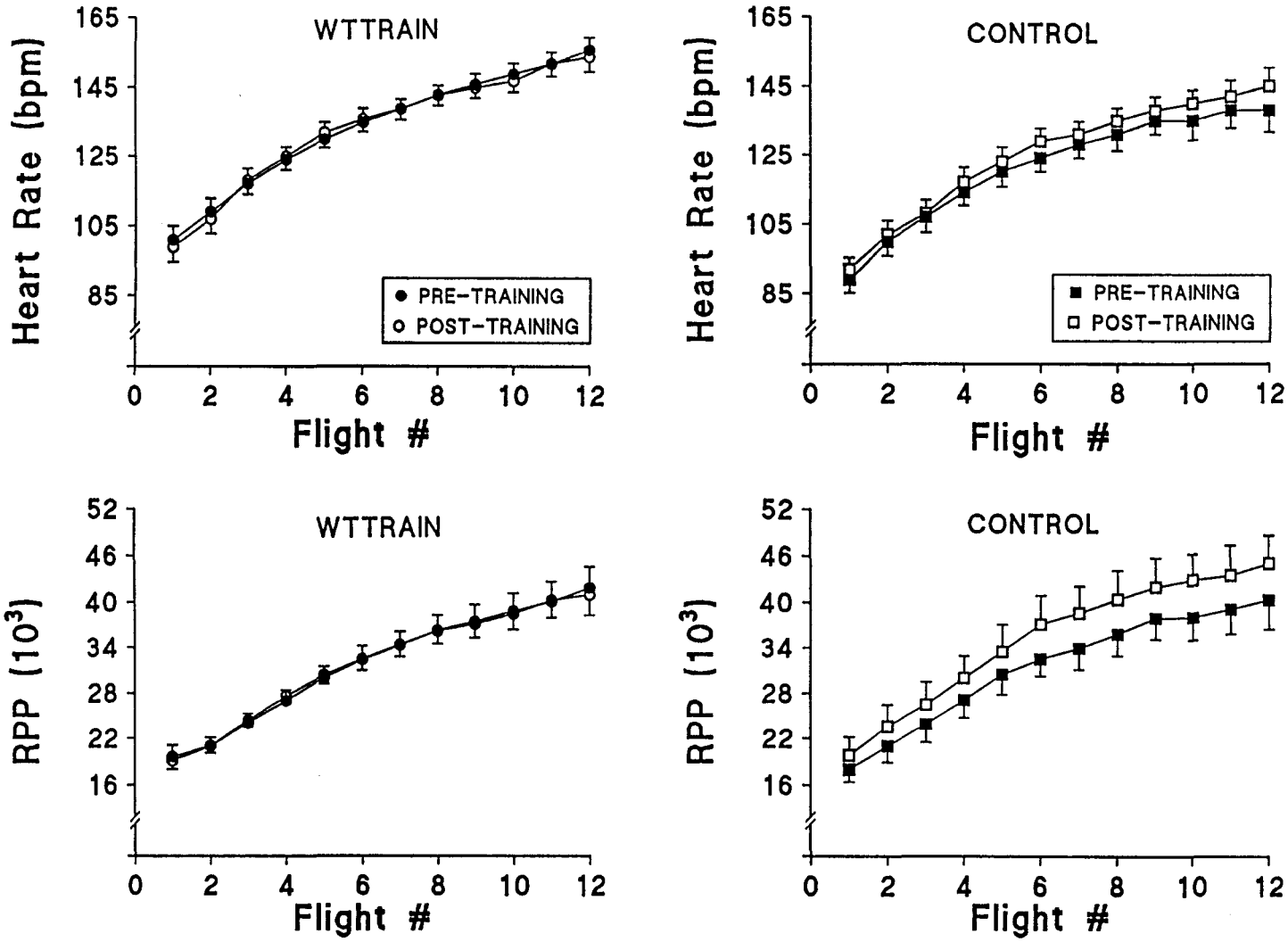


Figure 26. Heart rate and rate-pressure product (means ± SE) during 12 flights of stairclimbing at a rate of 60 steps per minute, pre- and post- (refer to legend) 10 weeks of weight-training or control.

STAIRMASTER PRE-POST TRAINING



3.3.8.5 Heart Rate

Training did not result in significant decreases in the heart rate response in the wttrain or control group (Figure 26).

The heart rate response overall was 88 per cent of the maximal predicted value for this population (Jones, 1988).

3.3.8.6 Rate-Pressure Product

After training the rate-pressure product was not attenuated (overall from 31.9 ± 1.9 to 31.9 ± 1.6), but a significant increase (3-way interaction, $p < 0.036$) for each flight was found in the control group (overall increase 31.5 ± 2.7 to 35.2 ± 3.4) (Figure 26).

4.0 DISCUSSION

4.1 Introduction

The reduced muscle strength of older individuals has been attributed to the natural aging process and to progressive inactivity (Vandervoort et al., 1986). Training programmes and recreational activities designed to reduce or even reverse the rate of decline in strength and muscle mass have emphasized low intensity dynamic exercise involving large muscle groups such as walking.

The beneficial effects of traditional aerobic training have been extensively studied and as such it is the preferred exercise form. However, the benefits of weightlifting as a mode of training for older adults has been the topic of current investigations. The older individual who weight-trains can expect increases in strength, and perhaps increases in whole muscle and muscle fiber size (Aniansson et al., 1984; Frontera et al., 1988; Hagberg et al., 1989; McCartney et al., 1989; Cononie et al., 1991; Brown et al., 1990).

Recent evidence also suggests that healthy young (Sale et al., 1990), older (McCartney et al., 1989), and cardiac patients (Wiecek, 1991) after weight-training can demonstrate reductions in heart rate and arterial blood pressure during repeated lifting of the same absolute loads.

The rate pressure product is simply the product of heart rate and systolic blood pressure and is a sensitive indicator of myocardial oxygen demand. Theoretically, weightlifting

training which lowers heart rate and arterial blood pressure responses during lifting of identical absolute loads results in decreased cardiovascular strain. More importantly, the potential exists for older adults to perform strength-related activities of daily life with a lower myocardial oxygen consumption. Thus, weightlifting training may contribute to enhanced independence and quality of life for older individuals.

4.2 Purpose

The purpose of this thesis was to determine whether 10 weeks of weightlifting training would result in significant reductions in heart rate and arterial blood pressure during lifting of identical absolute loads, and whether the effect would transfer to activities of daily living which involved the trained muscle groups.

4.3 Training Effects on Measurements of Maximum Isometric Handgrip Strength and Weightlifting Capacity

The 61 per cent mean increase in the SAC 1 RM was similar to that observed in healthy young and older subjects (Hurley et al., 1984; McCartney et al., 1989; Brown et al., 1990; Sale et al., 1990).

A strength gain of 30 per cent overall was noted for the SAMP in the wttrain group which was greater than that reported in two similar studies of coronary artery disease patients. Crozier Ghilarducci et al. (1989) found a 13 per cent

improvement in 1 RM overhead press strength, while a 17 per cent increase was found by Kelemen and co-workers (1986).

In the present study, a 27 per cent mean increase in strength was found for both the SLP and DLP exercises which was comparable to the 24 per cent improvement noted by McCartney et al. (1989). Brown and colleagues (1990) reported a mean increase of 23 per cent in bilateral leg press strength after 12 weeks of weightlifting training. Studies of subjects beyond 70 years have reported overall lower limb strength gains of 9-18 per cent (Hagberg et al., 1989; Cononie et al., 1991).

The improvements in weightlifting performance observed in the present study can be related to initial strength levels and to the intensity and duration of the training programme. The expected improvements in strength increase as training progresses to higher percentages of the subject's 1 RM (Frontera et al., 1988). The relative gain in 1 RM values could, in part, be due to lower initial arm, and higher leg strength. Thus, the smaller gains in strength between the large muscle groups of the lower limbs which are involved in daily activities, such as walking and stairclimbing, when compared to those of the upper body, may be due to differences in overall conditioning. However, the pre-training 1 RM values at the onset of training in this study were comparable to recent investigations of a similar population of older subjects (McCartney et al., 1989; Brown et al., 1990).

Compliance in this study was very good and may have contributed to the substantial gains in strength. Studies of subjects in the seventh decade of life may lack sufficient intensity to elicit similar improvements in strength (Hagberg et. al., 1989; Cononie et al., 1991).

The isometric handgrip performance of the dominant arm was unaltered after training. However, the dynamic strength performance on the weightlifting apparatus improved significantly, which suggests that there was a high degree of specificity in the training response. The specificity of training may be associated with nervous system adaptations, in particular, the role of learning and coordination (Rutherford et al., 1986). On the basis of these data, it appears that to achieve an optimal strength training effect the exercise should simulate the target movement as closely as possible in relation to movement pattern, velocity of movement, muscular contraction type and contraction force (Sale & MacDougall, 1981).

4.4 Changes in the Cardiovascular Response After Weight-training

4.4.1 Resting Changes in the Cardiovascular Response

In agreement with the work of others (Wilmore et al., 1978; Kanakis et al., 1980; Crozier Ghilarducci et al., 1989; McCartney et al., 1989; Sale et al., 1990; Cononie et al., 1991; Wiecek, M.Sc. thesis, 1991) values of resting arterial

blood pressure and heart rate were unchanged after 10 weeks of dynamic resistance training, which is also similar to previous studies of aerobic exercise (Frick et al., 1963; Cunningham et al., 1987).

4.4.2 Changes in the Cardiovascular Response During Weightlifting

Training resulted in lower mean maximal systolic and diastolic pressures, and mean arterial pressure in each weightlifting exercise when subjects lifted the same absolute loads, which is consistent with the earlier findings of McCartney et al. (1989). However, the magnitude of the attenuation was less pronounced than previous reports of healthy older individuals (McCartney et al., 1989). It may be that the training response is dependent on the duration of the exercise programme. The intensity of the training as a contributing factor to the insignificant results may be excluded because gains in strength were not different from the reports of other investigations of older healthy adults (McCartney et al., 1989; Brown et el., 1990). However, the greatest increase in 1 RM occurred for the SAC. Consistent with this finding was that the greatest overall reduction in systolic and diastolic blood pressures were also found for the SAC exercise after training. Thus, in this study, the degree of improvement in weightlifting capacity may have been associated with the magnitude of the reduction in arterial pressure and heart rate.

It is tempting to speculate that the training-induced attenuation of heart rate and blood pressure during weightlifting is due to a reduction in central command. After training there were significant increases in strength, and any given absolute weight would represent a lower per cent of the subjects' initial 1 RM and demand less of a relative effort. Therefore, less central command would be necessary to generate the same muscle force, and the magnitude of the blood pressure response would be lower. MacDougall et al. (1990) support this conclusion by showing that the blood pressure response during weightlifting was more dependent on the degree of effort, or per cent MVC, rather than on the absolute force production of muscle. Furthermore, when subjects lift identical absolute loads it is likely that the neural output of mechanoreceptors in muscle is unchanged (MacDougall et al., 1990). The magnitude and the speed at which arterial pressure rises at the onset of lifting also implies that the central neural mechanism plays a major role in the cardiovascular response during weightlifting (MacDougall et al., 1985). In contrast to these data, studies which were designed to deliberately weaken subjects reported increased cardiovascular responses, and consequently, the central command was thought to increase (Asmussen et al., 1943; Asmussen et al., 1965; Leonard et al., 1985; Mitchell et al., 1989).

Some control group subjects were slightly weaker at the post-testing 1 RM evaluation, which may partly explain the increased arterial pressure demonstrated during certain weightlifting exercises.

The mean peak rate pressure product for a given absolute load was attenuated in each exercise after training. It follows then that the myocardial oxygen demand would be less when subjects lifted the same absolute weight, and the cardiovascular strain on the heart should not be as great.

In some cases, the mean maximal arterial pressures, heart rate and rate pressure product values were higher in the four weightlifting exercises when subjects lifted the post-training 1 RMs. Previous reports from similar weightlifting studies in healthy males (Sale et el., 1990) and in patients with coronary artery disease (Wiecek, M.Sc. thesis, 1991) support these data . In contrast, McCartney et al. (1989) reported similar heart rate and arterial pressure responses in healthy older men during lifting with the same relative loads after training.

An explanation for the increased blood pressure responses during lifting of the identical relative load may be due to increased size of the trained muscle mass and therefore, increased mechanical compression of the blood vessels associated with the active muscle. Thus, the increased total peripheral resistance results in a concomitant elevation in arterial pressure. These data support the theory that the

size of the active muscle mass helps to determine the magnitude of the blood pressure response during weightlifting. While the finding in the present study that the DLP elicited higher arterial pressures than the SAC is in agreement with this theory , the less dramatic differences found between the SLP and DLP and the SAMP and DLP contradicts this hypothesis. Secondly, subjects in the trained group may have failed to demonstrate a true maximum effort during pre-training strength evaluations. In other words, what was considered 70 or 80 per cent of maximum for pre-training testing may have been underestimated due to subjects' fear of over-exertion. This explanation suggests that the intensity of effort or per cent of the 1 RM determines the magnitude of the blood pressure response.

4.5 Changes in the Cardiovascular Responses During Handgrip Dynamometry at 50 Per Cent Pre- and Post Training MVC

When subjects performed the handgrip at 50 per cent of the same absolute or relative MVC after training no significant alterations in arterial pressures, heart rate or rate pressure product were observed. These results would be expected since maximum isometric handgrip strength was unchanged after training. These data provide further support for the specificity of training.

4.6 Changes in the Cardiovascular Responses During Treadmill Walking

A modest transfer of the attenuated heart rate and arterial pressure responses observed during repeated weightlifting of the same absolute loads was evident during treadmill walking in the wttrain group. The modest transfer of the attenuated pressor response to exercise may be due to the fact that subjects trained only a few of the muscle groups involved in treadmill walking.

A greater transference of the attenuated pressor response seen during weightlifting may have occurred if the strength exercises more closely simulated the activities of daily living. For example, when subjects combine a static component, such as bag carrying, with a mild dynamic activity, such as walking, a reduced arterial blood pressure response would be expected to occur if the individual's forearm flexors or other relevant musculature were trained in the isometric mode.

A longer training programme may have also enhanced the cardiovascular transfer effects observed in the present study.

4.7 Changes in the Cardiovascular Responses During Stairclimbing

The lower cardiovascular responses observed during weightlifting at the same absolute intensity after training did not transfer to stairclimbing. The lack of any significant alterations in the arterial blood pressure response may be explained by the fact that most subjects had

to grip the handrail (although encouraged not to do so) of the Stairmaster ergometer to maintain balance, and to complete the final flights of the exercise. In this situation, the total peripheral resistance would be expected to increase and elevate arterial blood pressure. Furthermore, the heart rate response overall was near the maximal predicted value for this population. Thus, any weight-training reductions in the circulatory response to near maximal or submaximal dynamic exercise tasks of daily life in older adults may require a more specific training regimen which emphasizes the movement patterns, velocity of movement, contraction type and contraction force characteristic of the activity being performed (Sale & MacDougall, 1981).

5.0 Summary and Recommendations

5.1 Summary

Several recent studies have shown that weightlifting training not only improves muscle strength, but has the potential to reduce heart rate and arterial blood pressure during lifting of identical absolute loads.

The weight-training-induced cardiovascular changes that occur during lifting, and the transfer of this response to strength-related activities of daily living in older adults has been the scope of this thesis.

Training resulted in significant improvements in overall strength for the SAC (61 per cent), SAMP (30 per cent), SLP (27 per cent) and DLP (27 per cent) exercises.

The cardiovascular responses during lifting of the same absolute loads were reduced after training. Two neural mechanisms of cardiovascular control, central command and the exercise pressor reflex, are operative during exercise. Central command involves neural signals that descend from the higher motor centers of the brain which directly activate the cardiovascular control areas in the medulla. The exercise pressor reflex mechanism suggests that afferent signals arising in contracting skeletal muscle reflexly activate the same cardiovascular control centers in the medulla. The results of the present study are probably due to a reduction in central command. In other words, a given absolute load in a stronger muscle after training represented a lower per cent of the subjects' 1 RM; less "central command" was required to lift the weight and the arterial blood pressure response was reduced. In some cases, when subjects lifted the same relative load after training the cardiovascular responses increased. The elevated pressor response may be due to increased mechanical compression of blood vessels, increased size of the active muscle mass after training or underestimated pre-training 1 RM values.

The lower cardiovascular responses evident during lifting of identical absolute loads after training appeared to

modestly transfer to treadmill exercise, but not to stairclimbing. However, the exercises during the 10 week (30 sessions) weightlifting training programme in this study were not specifically matched to the selected activities of daily living and the stairclimbing was, in fact, a maximal exercise task.

5.2 Recommendations

Future research can best be directed towards overcoming the limitations of this study by including a larger sample size and a longer training period. In addition, the transfer effects of the training-induced attenuations of the cardiovascular responses during weightlifting will be maximized if the strength exercises simulate as closely as possible the selected activities of daily living.

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APPENDIX A

INTERESTED SENIORS!!!

Dr. Neil McCartney and a team of researchers from the Departments of Physical Education and Medicine at McMaster University are looking for healthy males between the ages of 60 and 70 to participate in a research study examining the effects of weight-training on arterial blood pressure. All candidates must be untrained and be willing to participate in three supervised training sessions per week for ten weeks at McMaster University. Parking expenses will be covered.

Volunteers will be medically screened before being accepted as participants in the study.

Come on out and enjoy yourself!

For more information please call SALLY GIBSON at 525-9140, Ext. 2576, 3596 or 3582.

APPENDIX B

PRE-SCREENING QUESTIONNAIRE

NAME:_____

ADDRESS:_____
_____
_____
_____

TELEPHONE:_____

OHIP #:_____

DATE OF BIRTH:_____

1.AGE?_____

2.APPROXIMATE HEIGHT AND WEIGHT?_____

3.HEART DISEASE?_____

4.HIGH BLOOD PRESSURE?_____

5.LUNG DISEASE?_____

6.MEDICATIONS?_____

7.SMOKING HISTORY?_____

8.HIGH CHOLESTEROL?_____

9.ARTHRITIS?_____

10.OTHER ORTHOPEDIC PROBLEMS?_____

11.CURRENT EXERCISE HABITS?_____

12.AVAILABLE TRANSPORTATION?_____

13.HOLIDAY PLANS/TIME COMMITMENTS?_____

14.PHYSICIANS NAME,ADDRESS TELEPHONE? _____
_____
_____
_____

NOTES:_____
_____
_____

APPENDIX C

McMASTER UNIVERSITY
School of Physical Education and Athletics
1280 Main Street West, Hamilton, Ontario L8S 4K1
Telephone: 525-9140 Ext. 3400

TRAINING STUDY 1990

PHYSICIAN INFORMATION OUTLINE

Dear Dr. _____:

Re: **THE EFFECTS OF WEIGHTLIFTING TRAINING ON ARTERIAL BLOOD PRESSURE DURING STRENGTH-RELATED ACTIVITIES OF DAILY LIVING IN OLDER ADULTS**

Your patient, Mr. _____ has consented to take part in the above study which involves participation in a 10 week dynamic strength training program, three times a week, for one hour. Before acceptance into the study, subjects will be required to perform a maximal progressive incremental exercise test on a cycle ergometer, conducted at the McMaster University Medical Centre and which we will arrange. Blood pressure, heart rate and rhythm will be monitored throughout the test; any abnormal responses during this test will serve as exclusion criteria for the study. Exercise test results will be sent to you from the hospital.

The purpose of this study is to measure the heart rate and intra-brachial artery blood pressure responses of older individuals during a wide variety of weightlifting activities and to determine if 12 weeks of strength training results in the attenuation of heart rate and arterial blood pressure during strength-related activities of daily living. Intra-brachial artery pressure will be assessed once prior to training and once following the 12 week training period using a brachial artery catheter system identical to the one used in our many previous studies. The arterial catheter will be introduced and monitored by cardiologist Dr. R.S. McKelvie.

The subjects will be 20 healthy untrained male volunteers, 60-70 years of age.

We are seeking your assistance in determining Mr. _____ general health status and would be grateful if you would complete the attached form and return it as soon as possible.

If you have any problems, please feel free to contact me. Thank you for your cooperation.

Yours sincerely,

Neil McCartney

Dr. Neil McCartney, Ph.D.,
Assistant Professor,
Physical Education and Medicine,
Program Director,
Chedoke-McMaster Hospitals/
McMaster University Cardiac
Exercise Rehabilitation Program.
525-9140, Ext. 4469

Attachment

TRAINING STUDY 1990

HEALTH STATUS FORM

PATIENT'S NAME _____ PHYSICIAN'S NAME _____

ADDRESS _____ ADDRESS _____

_____ _____

_____ _____

Tel. No. _____

EXAMINATION _____

Does Mr. _____ have any evidence of the following clinical disorders which might limit exercise or be associated with risk?

	YES	NO
Heart Disease	___	___
Lung Disease	___	___
Hypertension	___	___
Diabetes	___	___
Asthma	___	___
Bronchitis	___	___
Arthritis	___	___
Other conditions that would exclude participation in an exercise program	___	___

If yes, please give details _____

_____

_____

Has the patient been on any medication over the last two months?

YES ___ NO ___

If yes, please give details _____

_____

Patient's resting blood pressure _____

Has the patient had a recent electrocardiogram? YES ___ NO ___

If yes, please indicate date _____ and result _____

_____

_____

In your opinion, is Mr. _____ in good health? YES ___ NO ___

If you have any other comments you wish to offer regarding Mr. _____ participation in this study, please indicate below.

_____

_____

_____

_____ _____

(DATE) (PHYSICIAN'S SIGNATURE)

APPENDIX D

McMASTER UNIVERSITY
School of Physical Education and Athletics
1280 Main Street West, Hamilton, Ontario L8S 4K1
Telephone: 525-9140 Ext. 3400

Arterial Blood Pressure During Strength-Related Activities of Daily Living: The Effects of Weightlifting Training

1. I, _____ consent to take part in a study which will examine my intra-arterial blood pressure responses during formal arm and leg weightlifting, and during walking on a treadmill and a stairclimbing ergometer.

2. Dr. Neil McCartney, Ph.D. the principal investigator, has informed me that the following procedures/measurements will be carried out before and after 10 weeks (30 sessions) of weightlifting training.

   (i) A catheter will be inserted into the brachial artery of my non-exercising arm, where it will remain throughout the testing procedures. I have been informed that Dr. Robert McKelvie, M.D., will be the cardiologist responsible for inserting the catheter, and providing medical care.

   (ii) I will perform 10 repetitions of single-arm curl and single arm military press exercises at 80% of maximum strength with the non-catheterized arm, and 15 repetitions of single- and double-leg press exercises at 80% of maximum strength.

   (iii) I will walk on a treadmill for 4 minutes at a speed of 3 mph and up an incline of 8%.

   (iv) I will walk on a treadmill for 10 minutes at 2.5 mph with no incline, and carry an attaché case weighing 20 pounds between 4-6 minutes; 30 pounds between 8-10 minutes.

   (v) I will ascend 15 flights (~4 minutes) at a cadence of 60 steps/minute on a Stairmaster 6000 Ergometer.

   (vi) I will perform a 60 second isometric contraction of the forearm muscles at 50% of maximum strength, using a handgrip dynamometer.

3. There may be some slight bruising from the catheter, but this should disappear in about 1 day. There is also a small chance that a blood clot may form and move to my hand. I am aware that this would cause some discomfort but I am

assured that such an event will be treated immediately by Dr. McKelvie, and will not cause any further problems. I understand that there may be some increased risk of a cardiac event while exercising, but that this risk is very small.

4. I understand that there will be no direct benefit to me from participating in this study, and that I may withdraw from the study at any time, even after signing this form, without prejudice. Any information that is collected about me during this study will be kept confidential, and if the results are published, I will not be identified in any way.

5. _____ _____ _____
Name (Print) Signature Date

6. _____ _____ _____
Witness (Print) Signature Date

7. I have explained the nature of the study to the subject and believe he has understood it.

_____ _____ _____
Name (Print) Signature Date

APPENDIX E

PROTOCOL A

Orientation:

* 10 minutes of treadmill walking @ 2.5 mph @ 0% grade

* 4 minutes of treadmill walking @ 3.0 mph up an incline of 8%

* 5 flights of stairclimbing

* practice lifting and breathing techniques for all weightlifting exercises

PROTOCOL B

Pre - Training Testing:

* warm up on treadmill 10 minutes @ 2.0 mph

* 10 reps. of single arm curl (SAC) with dominant arm @ 70% 1RM

* 10 reps. of single arm military press (SAMP) with dominant arm @ 70% 1RM

* 12 reps. of single leg press (SLP) @ 80% 1RM

* 12 reps. of double leg press (DLP) @ 80% 1RM

* handgrip 60 seconds at 50% MVC

SIMULATED ACTIVITIES OF DAILY LIVING:

* treadmill 4 minutes @ 3 mph @ 8% incline

* treadmill 10 minutes @ 2.5 mph with no incline;
  20 lbs. between 4-6 minutes
  30 lbs. between 8-10 minutes

* Stairmaster 12 floors at a speed of 60 steps/min.

PROTOCOL C

POST-TRAINING TESTING:

* warm-up on treadmill 10 minutes @ 2.0 mph

* Stairmaster 12 floors @ 60 steps/min.

* treadmill 10 minutes @ 2.5 mph with no incline
  20 lbs. between 4-6 minutes
  30 lbs. between 8-10 minutes

* treadmill 4 minutes @ 3 mph @ incline 8%

* handgrip 60 seconds @ 50% pre-training MVC

* 12 reps. of DLP @ 80% of pre-training 1 RM

* 12 reps. of SLP @ 80% of pre-training 1 RM

* 10 reps. of SAMP with dominant arm @ 70% of pre-training 1 RM

* 10 reps. of SAC with dominant arm @ 70% of pre-training 1 RM

* 12 reps. of DLP @ 80% of POST-training 1 RM

* 12 reps. of SLP @ 80% of POST-training 1 RM

* 10 reps. of SAMP with dominant arm @ 70% POST-training 1 RM

* 10 reps. of SAC with dominant arm at 70% of POST-training 1 RM

* handgrip 60 seconds @ 50% POST-training MVC

APPENDIX F

TRAINING RECORD

SUBJECT COMPLIANCE

WTTRAIN GROUP

SESSION #	A	B	C	D	E	F	G	H	I	J
1	JULY 11	JULY 16	JULY 23	JULY 16	JAN. 8	JAN. 2	DEC. 14	OCT. 15	SEPT. 17	SEPT. 5
2	13	18	25	18	11	4	17	17	19	7
3	16	20	27	20	14	7	19	19	-	7
4	18	23	30	23	16	9	21	22	24	10
5	20	25	AUG. 1	25	18	11	-	24	26	12
6	23	27	3	27	21	14	-	26	28	14
7	25	30	6	30	23	16	-	29	OCT. 1	17
8	27	AUG. 1	8	AUG. 1	25	18	-	31	3	19
9	30	3	10	3	28	21	JAN. 2	NOV. 2	5	21
10	AUG. 1	6	-	6	30	23	4	5	-	24
11	3	8	15	8	FEB. 1	25	7	7	10	26
12	6	10	17	10	4	28	9	9	12	28
13	8	13	20	13	6	30	11	12	-	OCT. 1
14	10	15	22	15	8	FEB. 1	14	14	17	3
15	13	-	24	17	11	4	16	16	19	5
16	15	20	27	20	13	6	18	-	22	8
17	17	22	29	22	15	8	21	-	24	10
18	-	24	31	24	-	11	23	-	26	12
19	22	27	SEPT. 3	27	20	13	25	-	29	15
20	24	29	5	29	-	15	28	-	31	17
21	27	31	-	31	-	18	30	30	-	-
22	29	SEPT. 3	10	SEPT. 3	-	20	FEB. 1	DEC. 3	-	22
23	31	5	12	5	MARCH 1	22	4	5	NOV. 7	24
24	SEPT. 3	7	14	7	4	25	6	7	9	26
25	5	10	-	10	6	27	8	10	12	29
26	-	12	19	12	8	-	11	12	14	31
27	-	14	21	14	11	MARCH 4	13	14	16	NOV. 2
28	12	17	24	17	13	6	15	17	19	5
29	14	19	26	19	15	8	18	19	21	9
30	17	21	28	21	18	11	20	21	23	12
Sessions completed out of 30 consecutive training days	27.0	29.0	27.0	30.0	26.0	29.0	26.0	25.0	25.0	29.0
PER CENT (%)	90	97	90	100	87	97	87	83	83	97

	N	MEAN	S.D.	SEM
	10.0	27.3	1.8	0.6

	N	MEAN	S.D	SEM
	10.0	91.1	6.2	2.1

** SUBJECTS CONTINUED TRAINING UNTIL 30 SESSIONS WERE COMPLETED

APPENDIX G

(i) Stress Test Data

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
Age (years)	63.0	65.0	60.0	63.0	68.0	67.0	60.0	66.0	65.0	61.0	10.0	63.8	2.9	1.0	60.0	65.0	66.0	65.0	65.0	5.0	64.2	2.4	1.2
Height (cm)	162.0	171.0	172.0	180.0	178.0	176.0	165.0	170.0	186.0	175.0	10.0	173.5	7.1	2.4	174.0	170.0	182.0	173.0	174.0	5.0	174.6	4.5	2.2
Weight (kg)	75.0	85.0	93.0	73.0	80.0	91.0	76.0	94.0	88.0	100.0	10.0	85.5	9.2	3.1	94.0	74.0	96.0	79.0	94.0	5.0	87.4	10.1	5.1
Rest SBP (Torr)	130.0	140.0	130.0	140.0	90.0	150.0	115.0	140.0	160.0	160.0	10.0	136.0	21.6	7.3	150.0	160.0	140.0	125.0	160.0	5.0	147.0	14.8	7.4
Rest DBP (Torr)	80.0	85.0	75.0	90.0	60.0	85.0	75.0	90.0	85.0	95.0	10.0	82.0	10.1	3.4	90.0	90.0	90.0	75.0	85.0	5.0	86.0	6.5	3.3
Rest HR (bpm)	82.0	111.0	71.0	85.0	59.0	66.0	87.0	78.0	67.0	114.0	10.0	82.0	18.4	6.1	80.0	75.0	76.0	72.0	110.0	5.0	82.6	15.6	7.8
Rest RPP	10.7	15.5	9.2	11.9	5.3	9.9	10.0	10.9	10.7	18.2	10.0	11.2	3.5	1.2	12.0	12.0	10.6	9.0	17.6	5.0	12.2	3.2	1.6
Max Power Output (kpm/min)	900.0	800.0	1000.0	900.0	900.0	900.0	800.0	800.0	900.0	1000.0	10.0	890.0	73.8	24.6	1000.0	900.0	900.0	700.0	900.0	5.0	880.0	109.5	54.8
Max SBP (Torr)	190.0	200.0	215.0	200.0	190.0	190.0	190.0	180.0	210.0	160.0	10.0	192.5	15.5	5.2	210.0	210.0	200.0	160.0	230.0	5.0	202.0	25.9	12.9
Max DBP (Torr)	80.0	95.0	80.0	100.0	70.0	85.0	80.0	90.0	90.0	100.0	10.0	88.0	8.2	2.7	90.0	95.0	90.0	80.0	90.0	5.0	89.0	5.5	2.7
Max HR (bpm)	164.0	147.0	148.0	166.0	143.0	144.0	143.0	118.0	140.0	157.0	10.0	147.0	13.7	4.8	148.0	145.0	122.0	129.0	153.0	5.0	139.4	13.2	6.6
Max RPP	31.2	29.4	31.8	33.2	27.2	27.4	27.2	21.2	29.4	25.1	10.0	28.3	3.5	1.2	31.1	30.5	24.4	20.6	35.2	5.0	28.4	5.8	2.9

(ii) (1) One Repetition Maximum Values
Isometric Handgrip (kg)

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J					A	B	C	D	E					
Session #											N	MEAN	S.D.	SEM						N	MEAN	S.D.	SEM
PRE-TRAIN	41.0	45.0	42.0	55.0	50.0	55.0	43.0	40.0	55.0	53.0	10.0	47.9	6.3	2.1	49.0	59.0	55.0	41.5	46.0	5.0	50.1	7.0	3.5
1-6	45.0	45.0	43.0	55.0	50.0	55.0	43.0	47.0	57.0	56.0	10.0	49.6	5.7	1.9	-	-	-	-	-	5.0	-	-	-
7-12	46.0	45.0	43.0	60.0	50.0	55.0	43.0	47.0	57.0	58.0	10.0	50.4	6.5	2.2	-	-	-	-	-	5.0	-	-	-
13-18	46.0	45.0	45.0	60.0	50.0	55.0	44.0	47.0	57.0	58.0	10.0	50.7	6.2	2.1	-	-	-	-	-	5.0	-	-	-
19-24	46.0	45.0	45.0	60.0	50.0	55.0	44.0	51.0	57.0	58.0	10.0	51.1	6.0	2.0	-	-	-	-	-	5.0	-	-	-
25-30	50.0	50.0	48.0	60.0	50.0	55.0	44.0	51.0	57.0	58.0	10.0	52.3	5.0	1.7	39.0	66.0	55.0	41.5	53.0	5.0	50.9	10.9	5.5

One Repetition Maximum Values
Single-Arm Military Press (kg)

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J					A	B	C	D	E					
Session #											N	MEAN	S.D.	SEM						N	MEAN	S.D.	SEM
PRE-TRAIN	17.5	15.0	23.5	16.0	14.5	14.5	20.0	10.0	15.0	27.5	10.0	17.4	5.1	1.7	12.5	18.5	20.0	11.0	21.0	5.0	16.6	4.5	2.3
1-6	16.0	16.0	23.5	18.5	15.0	16.0	22.5	11.5	16.0	30.0	10.0	18.5	5.4	1.8	-	-	-	-	-	5.0	-	-	-
7-12	16.0	18.5	24.5	21.0	15.0	16.5	22.5	15.0	18.0	32.5	10.0	20.0	5.5	1.8	-	-	-	-	-	5.0	-	-	-
13-18	18.5	20.0	26.0	22.5	17.5	17.0	22.5	15.0	20.0	32.5	10.0	21.2	5.1	1.7	-	-	-	-	-	5.0	-	-	-
19-24	22.5	22.5	27.5	23.0	18.5	17.5	22.5	15.0	21.0	36.5	10.0	22.7	6.0	2.0	-	-	-	-	-	5.0	-	-	-
25-30	22.5	22.5	27.5	23.0	18.5	18.5	22.5	15.0	21.0	36.5	10.0	22.8	5.9	2.0	12.5	18.5	20.0	11.0	21.0	5.0	16.6	4.5	2.8

One Repetition Maximum Values
Single–Arm Curl (kg)

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J					A	B	C	D	E					
Session #											N	MEAN	S.D.	SEM						N	MEAN	S.D.	SEM
PRE-TRAIN	12.5	15.5	21.3	15.5	14.8	11.8	18.8	14.8	14.0	46.0	10.0	18.5	10.1	3.4	13.3	16.3	20.0	12.5	16.4	5.0	15.7	3.0	1.5
1-6	15.0	16.3	26.3	17.3	14.8	14.8	20.0	15.5	14.0	58.0	10.0	21.2	13.4	4.5	-	-	-	-	-	5.0	-	-	-
7-12	14.8	25.0	31.0	20.0	18.8	15.5	25.0	16.3	15.5	58.0	10.0	24.0	13.1	4.4	-	-	-	-	-	5.0	-	-	-
13-18	17.5	32.0	35.0	20.0	18.8	15.5	26.3	16.3	16.3	71.0	10.0	26.9	17.0	5.7	-	-	-	-	-	5.0	-	-	-
19-24	20.0	38.8	47.5	22.5	23.8	15.5	36.3	16.3	16.3	76.0	10.0	31.3	19.2	6.4	-	-	-	-	-	5.0	-	-	-
25-30	20.0	40.0	53.8	23.8	23.8	15.5	36.3	21.3	16.3	76.0	10.0	32.7	19.4	6.5	11.8	16.3	20.0	12.5	16.4	5.0	15.4	3.3	1.7

One Repetition Maximum Values
Single–Leg Press (kg)

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J					A	B	C	D	E					
Session #											N	MEAN	S.D.	SEM						N	MEAN	S.D.	SEM
PRE-TRAIN	105.0	80.0	95.0	70.0	70.0	70.0	90.0	57.5	75.0	105.0	10.0	81.8	16.2	5.4	80.0	80.0	90.0	60.0	85.0					
1-6	120.0	82.5	95.0	77.5	70.0	75.0	90.0	70.0	77.5	130.0	10.0	88.8	20.8	6.9	-	-	-	-	-					
7-12	122.5	90.0	100.0	86.0	75.0	80.0	100.0	75.0	80.0	130.0	10.0	93.9	19.4	6.5	-	-	-	-	-					
13-18	130.0	90.0	100.0	86.0	75.0	85.0	102.5	75.0	85.0	140.0	10.0	96.9	22.1	7.4	-	-	-	-	-					
19-24	140.0	100.0	105.0	86.0	90.0	85.0	105.0	75.0	87.5	150.0	10.0	102.4	24.5	8.2	-	-	-	-	-					
25-30	140.0	100.0	105.0	86.3	90.0	95.0	105.0	75.0	87.5	160.0	10.0	104.4	26.1	8.7	80.0	75.0	90.0	60.0	85.0					

One Repetition Maximum Values

Double-Leg Press (kg)

	WTTRAIN GROUP														CONTROL GROUP								
	A	B	C	D	E	F	G	H	I	J					A	B	C	D	E				
Session #											N	MEAN	S.D.	SEM						N	MEAN	S.D.	SEM
PRE-TRAIN	195.0	150.0	160.0	125.0	120.0	112.5	150.0	107.5	140.0	240.0	10.0	150.0	40.9	13.6	130.0	140.0	160.0	120.0	157.5	5.0	141.5	17.3	8.6
1-6	222.5	150.0	160.0	140.0	120.0	135.0	160.0	130.0	140.0	250.0	10.0	160.8	42.2	14.1	-	-	-	-	-	5.0	-	-	-
7-12	230.0	170.0	175.0	145.0	150.0	140.0	170.0	137.5	145.0	250.0	10.0	171.3	38.9	13.0	-	-	-	-	-	5.0	-	-	-
13-18	240.0	170.0	180.0	155.0	155.0	155.0	180.0	137.5	145.0	270.0	10.0	178.8	43.1	14.4	-	-	-	-	-	5.0	-	-	-
19-24	269.0	180.0	185.0	152.5	170.0	155.0	185.0	140.0	147.5	275.0	10.0	185.9	48.1	16.0	-	-	-	-	-	5.0	-	-	-
25-30	269.0	185.0	185.0	157.5	170.0	157.5	185.0	150.0	152.5	290.0	10.0	190.2	46.3	15.4	140.0	135.0	160.0	120.0	170.0	5.0	145.0	20.0	10.0

One Repetition Maximum Values
Isometric Handgrip (kg)
[non-dominant]

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
Session #																								
PRE-TRAIN	42.0	35.0	45.0	55.0	41.0	50.0	55.0	38.0	50.0	53.0	10.0	46.4	7.2	2.4	44.0	48.0	53.0	43.0	41.0	5.0	45.8	4.8	2.4
1-6	46.5	36.0	49.0	55.0	43.0	50.0	55.0	39.0	50.0	60.0	10.0	48.4	7.5	2.5	-	-	-	-	-	5.0	-	-	-
7-12	43.0	37.5	50.5	58.0	43.0	50.0	55.0	39.0	50.0	60.0	10.0	48.6	7.8	2.6	-	-	-	-	-	5.0	-	-	-
13-18	44.0	41.0	50.5	58.0	43.0	53.0	55.0	49.0	50.0	60.0	10.0	50.4	6.4	2.1	-	-	-	-	-	5.0	-	-	-
19-24	48.0	43.0	50.5	58.0	43.0	53.0	55.0	42.0	50.0	60.0	10.0	50.3	6.4	2.1	-	-	-	-	-	5.0	-	-	-
25-30	48.0	43.0	50.5	58.0	43.0	53.0	55.0	42.0	56.0	60.0	10.0	50.9	6.6	2.2	36.5	53.0	53.0	43.0	47.0	5.0	46.5	7.0	3.5

One Repetition Maximum Values
Single-Arm Military Press (kg)
[non-dominant]

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
Session #																								
PRE-TRAIN	15.0	15.0	23.5	13.5	15.0	11.0	16.0	8.5	15.0	27.5	10.0	16.0	5.6	1.9	12.5	15.0	19.0	10.0	18.5	5.0	15.0	3.9	1.9
1-6	17.0	15.0	25.0	16.0	15.0	13.0	17.5	11.5	15.0	27.5	10.0	17.3	5.1	1.7	-	-	-	-	-	5.0	-	-	-
7-12	20.5	18.5	25.0	18.5	15.0	13.5	18.0	15.0	16.5	27.5	10.0	18.8	4.5	1.5	-	-	-	-	-	5.0	-	-	-
13-18	20.5	18.5	26.0	20.0	15.0	14.0	18.5	15.0	16.5	27.5	10.0	19.2	4.6	1.5	-	-	-	-	-	5.0	-	-	-
19-24	22.5	22.5	26.5	21.0	15.0	15.0	19.0	15.0	16.5	27.5	10.0	20.1	4.7	1.6	-	-	-	-	-	5.0	-	-	-
25-30	22.5	22.5	27.5	21.0	15.0	18.0	19.0	15.0	16.5	27.5	10.0	20.5	4.6	1.5	12.5	15.0	19.0	10.0	18.5	5.0	15.0	3.9	1.9

One Repetition Maximum Values
Single-Arm Curl (kg)
[non-dominant]

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J					A	B	C	D	E					
Session #											N	MEAN	S.D.	SEM						N	MEAN	S.D.	SEM
PRE-TRAIN	13.4	13.4	21.4	14.9	12.6	10.4	15.6	12.6	14.1	40.0	10.0	16.8	8.6	2.9	12.6	13.4	18.9	11.1	8.9	5.0	13.0	3.7	1.9
1-6	15.9	15.6	26.4	17.6	12.6	11.9	15.6	14.9	14.1	40.0	10.0	18.4	8.6	2.9	-	-	-	-	-	5.0	-	-	-
7-12	15.6	20.1	28.4	20.1	16.4	11.9	20.1	15.6	15.6	40.0	10.0	20.4	8.2	2.7	-	-	-	-	-	5.0	-	-	-
13-18	15.6	27.8	30.0	20.1	16.4	13.4	21.4	16.4	16.4	40.0	10.0	21.7	8.4	2.8	-	-	-	-	-	5.0	-	-	-
19-24	15.6	28.6	41.4	22.6	21.4	13.4	23.9	16.4	16.4	40.0	10.0	23.9	9.9	3.3	-	-	-	-	-	5.0	-	-	-
25-30	15.9	28.6	41.4	23.9	21.4	14.8	23.9	17.6	16.4	40.0	10.0	24.4	9.6	3.2	11.1	13.4	18.9	11.1	8.9	5.0	12.7	3.8	1.9

One Repetition Maximum Values
Single-Leg Press (kg)
[non-dominant]

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J					A	B	C	D	E					
Session #											N	MEAN	S.D.	SEM						N	MEAN	S.D.	SEM
PRE-TRAIN	105.0	80.0	90.0	75.0	70.0	65.0	70.0	62.5	70.0	120.0	10.0	80.8	18.8	6.3	80.0	80.0	80.0	60.0	85.0	5.0	77.0	9.7	4.9
1-6	120.0	82.5	90.0	82.5	70.0	75.0	80.0	75.0	77.5	130.0	10.0	88.3	20.2	6.7	-	-	-	-	-	5.0	-	-	-
7-12	122.5	90.0	100.0	83.8	75.0	75.0	90.0	75.0	80.0	140.0	10.0	93.1	22.0	7.3	-	-	-	-	-	5.0	-	-	-
13-18	130.0	90.0	100.0	83.8	75.0	75.0	90.0	75.0	85.0	140.0	10.0	94.4	23.0	7.7	-	-	-	-	-	5.0	-	-	-
19-24	140.0	90.0	105.0	83.8	90.0	80.0	90.0	80.0	87.5	140.0	10.0	98.6	22.9	7.6	-	-	-	-	-	5.0	-	-	-
25-30	140.0	100.0	110.0	86.3	90.0	85.0	90.0	80.0	87.5	160.0	10.0	102.9	26.6	8.9	80.0	80.0	80.0	60.0	85.0	5.0	77.0	9.7	4.9

One Repetition Maximum Values – Combined
Isometric Handgrip (kg)

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
PRE	41.5	40.0	43.5	55.0	45.5	52.5	49.0	39.0	52.5	53.0	10.0	47.2	6.0	2.0	46.5	53.5	54.0	42.3	43.5	5.0	48.0	5.5	2.8
POST	49.0	46.5	49.3	59.0	46.5	54.0	49.5	46.5	56.5	59.0	10.0	51.6	5.1	1.7	37.8	59.5	54.0	42.3	50.0	5.0	48.7	8.8	4.4

One Repetition Maximum Values – Combined
Single–Arm Military Press (kg)

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
PRE	16.3	15.0	23.5	14.8	14.8	12.8	18.0	9.3	15.0	27.5	10.0	16.7	5.3	1.8	12.5	16.8	19.5	10.5	19.8	5.0	15.8	4.2	2.1
POST	22.5	22.5	27.5	22.0	16.8	18.3	20.8	15.0	18.8	32.0	10.0	21.6	5.1	1.7	12.5	16.8	19.5	10.5	19.8	5.0	15.8	4.2	2.1

One Repetition Maximum Values – Combined
Single–Arm Curl (kg)

	TREATMENT GROUP														CONTROL GROUP								
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
PRE	13.0	14.5	21.4	15.2	13.7	11.1	17.2	13.7	14.1	43.0	10.0	17.7	9.3	3.1	13.0	14.9	19.5	11.8	12.7	5.0	14.3	3.1	1.5
POST	18.0	34.3	47.6	23.8	22.6	15.2	30.1	19.5	16.4	58.0	10.0	28.5	14.3	4.8	11.5	14.9	19.5	11.8	12.6	5.0	14.0	3.3	1.7

One Repetition Maximum Values – Combined
Single–Leg Press (kg)

	TREATMENT GROUP														CONTROL GROUP								
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
PRE	105.0	80.0	92.5	72.5	70.0	67.5	80.0	60.0	72.5	112.5	10.0	81.3	17.0	5.7	80.0	80.0	85.0	60.0	85.0	5.0	78.0	10.4	5.2
POST	140.0	100.0	107.5	86.3	90.0	90.0	97.5	77.5	87.5	160.0	10.0	103.6	26.2	8.7	80.0	77.5	85.0	60.0	85.0	5.0	77.5	10.3	5.2

(iii) Rest Values (Pre-training)
Catheter Measurement

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
Peak SBP (Torr)	166.0	192.0	162.0	193.0	141.0	186.0	156.0	158.0	191.0	189.0	10.0	173.4	18.9	6.3	183.0	175.0	152.0	152.0	202.0	5.0	172.8	21.4	10.7
Peak DBP (Torr)	94.0	113.0	82.0	112.0	81.0	92.0	94.0	90.0	94.0	103.0	10.0	95.5	10.9	3.7	110.0	94.0	92.0	86.0	104.0	5.0	97.2	9.7	4.8
MAP (Torr)	119.0	129.0	106.0	135.0	89.0	113.0	95.0	100.0	127.0	119.0	10.0	113.2	15.4	5.1	127.0	107.0	108.0	102.0	128.0	5.0	114.4	12.2	6.1
HR (bpm)	85.0	111.0	71.0	71.0	51.0	70.0	83.0	68.0	60.0	103.0	10.0	77.3	18.6	6.2	76.0	71.0	66.0	67.0	84.0	5.0	72.8	7.4	3.7
RPP	14.1	21.4	11.5	13.7	7.2	13.0	13.0	10.5	11.5	19.5	10.0	13.5	4.2	1.4	13.9	12.4	10.1	10.1	17.0	5.0	12.7	2.9	1.4

Rest Values (Post-training)
Catheter Measurement

	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
Peak SBP (Torr)	161.0	181.0	159.0	186.0	160.0	173.0	155.0	159.0	217.0	202.0	10.0	175.3	21.1	7.0	198.0	188.0	161.0	138.0	199.0	5.0	176.8	26.6	13.3
Peak DBP (Torr)	90.0	101.0	85.0	111.0	96.0	89.0	91.0	88.0	115.0	106.0	10.0	97.2	10.5	3.5	112.0	102.0	91.0	78.0	106.0	5.0	97.8	13.5	6.7
MAP (Torr)	110.0	115.0	98.0	132.0	98.0	107.0	100.0	100.0	127.0	122.0	10.0	110.9	12.6	4.2	140.0	127.0	106.0	92.0	140.0	5.0	121.0	21.4	10.7
HR (bpm)	85.0	102.0	71.0	79.0	80.0	64.0	93.0	69.0	59.0	94.0	10.0	79.6	14.0	4.7	65.0	75.0	70.0	74.0	76.0	5.0	72.0	4.5	2.3
RPP	13.7	18.5	11.3	14.8	12.8	11.1	14.4	11.0	12.8	19.0	10.0	13.9	2.9	1.0	12.9	14.1	11.3	10.2	15.1	5.0	12.7	2.0	1.0

(iv) **Double-leg press @ 80% 1 RM (Pre-training)**
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	223.0	249.0	198.0	233.0	192.0	214.0	199.0	203.0	247.0	237.0	10.0	219.5	21.3	7.1	220.0	191.0	195.0	207.0	251.0	5.0	212.8	24.2	12.1
2	214.0	226.0	202.0	236.0	183.0	221.0	168.0	189.0	228.0	199.0	10.0	206.6	22.1	7.4	225.0	213.0	193.0	195.0	236.0	5.0	212.4	18.7	9.3
3	200.0	222.0	200.0	223.0	200.0	233.0	184.0	193.0	236.0	220.0	10.0	211.1	17.9	6.0	229.0	214.0	197.0	195.0	238.0	5.0	214.6	19.0	9.5
4	202.0	228.0	206.0	230.0	193.0	224.0	193.0	197.0	255.0	212.0	10.0	214.0	20.0	6.7	229.0	241.0	197.0	217.0	247.0	5.0	226.2	20.0	10.0
5	209.0	238.0	205.0	237.0	195.0	223.0	194.0	197.0	281.0	220.0	10.0	219.9	26.9	9.0	228.0	241.0	201.0	223.0	249.0	5.0	228.4	18.5	9.2
6	210.0	234.0	217.0	240.0	209.0	227.0	200.0	205.0	279.0	228.0	10.0	224.9	23.1	7.7	233.0	247.0	204.0	230.0	254.0	5.0	233.6	19.3	9.6
7	212.0	233.0	216.0	245.0	202.0	231.0	219.0	199.0	258.0	230.0	10.0	224.5	18.6	6.2	226.0	256.0	202.0	259.0	261.0	5.0	240.8	26.0	13.0
8	221.0	236.0	211.0	234.0	209.0	237.0	231.0	208.0	277.0	240.0	10.0	230.4	20.5	6.8	232.0	257.0	195.0	254.0	262.0	5.0	240.0	27.6	13.8
9	222.0	251.0	229.0	236.0	211.0	239.0	219.0	209.0	283.0	246.0	10.0	234.5	22.1	7.4	245.0	265.0	199.0	249.0	272.0	5.0	246.0	28.5	14.3
10	224.0	246.0	246.0	241.0	205.0	238.0	220.0	209.0	296.0	248.0	10.0	237.3	25.9	8.6	247.0	278.0	199.0	270.0	273.0	5.0	253.4	32.7	16.3
11	225.0	257.0	228.0	246.0	210.0	239.0	238.0	217.0	298.0	256.0	10.0	241.4	25.2	8.4	248.0	270.0	205.0	288.0	273.0	5.0	256.8	32.3	16.1
12	231.0	259.0	240.0	252.0	208.0	239.0	222.0	214.0	305.0	268.0	10.0	243.8	28.8	9.6	253.0	258.0	217.0	271.0	272.0	5.0	254.2	22.4	11.2

Double-leg press @ 80% of ORIGINAL 1 RM (Post-training)
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	203.0	224.0	197.0	215.0	181.0	222.0	209.0	197.0	247.0	256.0	10.0	215.1	23.1	7.7	216.0	246.0	207.0	186.0	245.0	5.0	220.0	25.7	12.9
2	185.0	200.0	186.0	230.0	185.0	225.0	206.0	201.0	251.0	242.0	10.0	211.1	24.4	8.1	216.0	250.0	190.0	201.0	239.0	5.0	219.2	25.2	12.6
3	188.0	198.0	203.0	213.0	198.0	227.0	204.0	215.0	245.0	242.0	10.0	213.3	19.2	6.4	213.0	253.0	195.0	208.0	242.0	5.0	222.2	24.3	12.2
4	194.0	200.0	195.0	207.0	188.0	231.0	195.0	199.0	259.0	250.0	10.0	211.8	25.6	8.5	218.0	265.0	205.0	228.0	243.0	5.0	231.8	23.2	11.6
5	196.0	206.0	194.0	209.0	180.0	231.0	211.0	207.0	269.0	236.0	10.0	213.9	25.4	8.5	228.0	269.0	199.0	225.0	245.0	5.0	233.2	25.9	13.0
6	203.0	211.0	192.0	210.0	189.0	234.0	198.0	210.0	269.0	253.0	10.0	216.9	26.6	8.9	221.0	276.0	203.0	255.0	255.0	5.0	242.0	29.4	14.7
7	199.0	213.0	193.0	212.0	188.0	234.0	211.0	210.0	274.0	266.0	10.0	220.0	29.3	9.8	217.0	282.0	207.0	244.0	261.0	5.0	242.2	30.9	15.4
8	202.0	220.0	197.0	216.0	192.0	241.0	217.0	210.0	276.0	257.0	10.0	222.8	27.1	9.0	224.0	282.0	206.0	255.0	260.0	5.0	245.4	30.2	15.1
9	202.0	228.0	203.0	222.0	198.0	237.0	225.0	205.0	274.0	253.0	10.0	224.7	24.7	8.2	222.0	285.0	207.0	256.0	263.0	5.0	246.6	31.6	15.8
10	207.0	230.0	202.0	227.0	197.0	241.0	216.0	210.0	276.0	254.0	10.0	226.0	25.1	8.4	234.0	290.0	211.0	252.0	267.0	5.0	250.8	30.3	15.1
11	207.0	232.0	200.0	233.0	197.0	246.0	234.0	216.0	279.0	273.0	10.0	231.7	28.3	9.4	243.0	287.0	215.0	261.0	273.0	5.0	255.8	27.9	14.0
12	212.0	236.0	212.0	230.0	201.0	241.0	220.0	212.0	280.0	273.0	10.0	231.7	26.6	8.9	235.0	289.0	215.0	257.0	279.0	5.0	255.0	30.6	15.3

GROUPxREP. INTERACTION - $p < 0.014$; TRAINxREP. INTERACTION - $p < 0.007$

Double-leg press @ 80% of NEW 1 RM (Post-training)
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	203.0	215.0	188.0	236.0	190.0	209.0	217.0	212.0	250.0	238.0	10.0	215.8	20.4	6.8	221.0	269.0	207.0	186.0	247.0	5.0	226.0	32.7	16.3
2	193.0	198.0	186.0	216.0	180.0	222.0	198.0	218.0	242.0	218.0	10.0	207.1	19.2	6.4	222.0	264.0	190.0	201.0	243.0	5.0	224.0	30.2	15.1
3	197.0	216.0	188.0	218.0	188.0	234.0	186.0	210.0	245.0	210.0	10.0	209.2	20.0	6.7	220.0	276.0	195.0	208.0	250.0	5.0	229.8	32.9	16.4
4	203.0	222.0	193.0	227.0	201.0	234.0	198.0	210.0	250.0	222.0	10.0	216.0	18.1	6.0	230.0	276.0	205.0	228.0	253.0	5.0	238.4	27.0	13.5
5	204.0	230.0	190.0	226.0	213.0	227.0	190.0	218.0	272.0	230.0	10.0	220.0	23.8	7.9	227.0	277.0	199.0	225.0	248.0	5.0	235.2	29.1	14.6
6	215.0	234.0	208.0	229.0	216.0	236.0	210.0	216.0	268.0	244.0	10.0	227.6	18.7	6.2	229.0	285.0	203.0	255.0	247.0	5.0	243.8	30.5	15.2
7	215.0	240.0	217.0	239.0	222.0	240.0	220.0	223.0	270.0	260.0	10.0	234.6	18.8	6.3	234.0	288.0	207.0	244.0	260.0	5.0	246.6	30.1	15.1
8	222.0	248.0	220.0	233.0	232.0	241.0	219.0	226.0	284.0	258.0	10.0	238.3	20.5	6.8	240.0	282.0	206.0	255.0	270.0	5.0	250.6	29.5	14.8
9	214.0	260.0	224.0	238.0	228.0	243.0	225.0	232.0	276.0	260.0	10.0	240.0	19.6	6.5	240.0	290.0	207.0	256.0	268.0	5.0	252.2	31.2	15.6
10	216.0	263.0	228.0	240.0	230.0	246.0	230.0	230.0	282.0	264.0	10.0	242.9	20.7	6.9	246.0	294.0	211.0	252.0	274.0	5.0	255.4	31.3	15.6
11	221.0	270.0	217.0	246.0	233.0	240.0	252.0	230.0	288.0	273.0	10.0	247.0	23.6	7.9	246.0	305.0	215.0	261.0	281.0	5.0	261.6	34.2	17.1
12	223.0	270.0	238.0	250.0	233.0	239.0	243.0	232.0	290.0	280.0	10.0	249.8	22.5	7.5	246.0	307.0	215.0	257.0	289.0	5.0	262.8	36.2	18.1

Double-leg press @ 80% 1 RM (Pre-training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	139.0	141.0	121.0	151.0	112.0	117.0	119.0	117.0	119.0	126.0	10.0	126.2	12.9	4.8	142.0	118.0	124.0	119.0	127.0	5.0	126.0	9.7	4.8
2	119.0	135.0	111.0	144.0	108.0	106.0	101.0	101.0	112.0	122.0	10.0	115.9	14.3	4.8	139.0	120.0	106.0	110.0	137.0	5.0	122.4	15.1	7.6
3	116.0	126.0	117.0	129.0	123.0	117.0	110.0	107.0	129.0	128.0	10.0	120.2	8.0	2.7	145.0	136.0	110.0	121.0	132.0	5.0	128.8	13.6	6.8
4	118.0	144.0	120.0	144.0	113.0	111.0	118.0	110.0	148.0	130.0	10.0	125.6	14.8	4.9	152.0	138.0	109.0	133.0	133.0	5.0	133.0	15.5	7.8
5	123.0	151.0	123.0	158.0	111.0	115.0	115.0	111.0	134.0	145.0	10.0	128.6	17.4	5.8	134.0	140.0	107.0	141.0	140.0	5.0	132.4	14.5	7.2
6	123.0	137.0	130.0	152.0	128.0	123.0	119.0	114.0	162.0	138.0	10.0	132.6	15.0	5.0	138.0	137.0	113.0	146.0	139.0	5.0	134.6	12.6	6.3
7	117.0	138.0	125.0	160.0	115.0	115.0	148.0	111.0	150.0	142.0	10.0	132.1	17.6	5.9	135.0	141.0	107.0	166.0	145.0	5.0	138.8	21.3	10.6
8	124.0	142.0	119.0	152.0	123.0	120.0	150.0	113.0	141.0	137.0	10.0	132.1	13.9	4.6	145.0	145.0	103.0	156.0	149.0	5.0	139.6	20.9	10.5
9	119.0	149.0	133.0	148.0	123.0	129.0	125.0	111.0	157.0	146.0	10.0	134.0	15.2	5.1	147.0	145.0	103.0	140.0	151.0	5.0	137.2	19.5	9.8
10	137.0	154.0	137.0	146.0	117.0	123.0	156.0	112.0	154.0	142.0	10.0	137.8	15.8	5.3	144.0	156.0	107.0	160.0	151.0	5.0	143.6	21.3	10.7
11	124.0	151.0	134.0	157.0	121.0	123.0	146.0	117.0	165.0	165.0	10.0	140.3	18.8	6.3	161.0	165.0	109.0	154.0	155.0	5.0	148.8	22.7	11.3
12	138.0	149.0	137.0	157.0	114.0	117.0	132.0	119.0	169.0	155.0	10.0	138.7	18.7	6.2	152.0	134.0	123.0	156.0	161.0	5.0	145.2	16.1	8.0

Double-leg press @ 80% of ORIGINAL 1 RM (Post-training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	118.0	157.0	108.0	148.0	108.0	121.0	133.0	112.0	125.0	133.0	10.0	126.3	16.8	5.5	123.0	147.0	101.0	101.0	126.0	5.0	119.6	19.3	9.7
2	101.0	116.0	108.0	144.0	115.0	112.0	127.0	107.0	125.0	150.0	10.0	120.5	16.1	5.4	118.0	155.0	106.0	123.0	131.0	5.0	126.6	18.3	9.1
3	110.0	118.0	122.0	132.0	120.0	113.0	121.0	120.0	127.0	133.0	10.0	121.6	7.4	2.5	126.0	160.0	107.0	117.0	131.0	5.0	128.2	20.0	10.0
4	109.0	120.0	120.0	126.0	115.0	114.0	118.0	109.0	134.0	151.0	10.0	121.6	12.8	4.3	120.0	174.0	114.0	125.0	133.0	5.0	133.2	23.8	11.9
5	111.0	122.0	116.0	123.0	113.0	115.0	121.0	115.0	140.0	153.0	10.0	122.9	13.4	4.5	126.0	174.0	109.0	133.0	135.0	5.0	135.4	23.9	11.9
6	123.0	128.0	118.0	125.0	112.0	116.0	126.0	112.0	139.0	159.0	10.0	125.8	14.3	4.8	140.0	167.0	108.0	149.0	140.0	5.0	140.8	21.4	10.7
7	113.0	129.0	109.0	133.0	117.0	120.0	148.0	119.0	143.0	167.0	10.0	129.8	18.2	6.1	138.0	187.0	117.0	151.0	143.0	5.0	147.2	25.6	12.8
8	116.0	134.0	112.0	132.0	120.0	120.0	137.0	114.0	144.0	162.0	10.0	129.1	15.8	5.3	126.0	180.0	113.0	147.0	148.0	5.0	142.8	25.5	12.7
9	112.0	137.0	118.0	138.0	116.0	119.0	133.0	111.0	144.0	177.0	10.0	130.5	20.2	6.7	140.0	174.0	114.0	139.0	147.0	5.0	142.8	21.5	10.7
10	115.0	139.0	115.0	138.0	120.0	126.0	138.0	115.0	145.0	168.0	10.0	131.9	17.1	5.7	146.0	175.0	117.0	144.0	152.0	5.0	146.8	20.7	10.4
11	113.0	144.0	120.0	148.0	114.0	121.0	132.0	116.0	146.0	173.0	10.0	132.7	19.7	6.6	148.0	198.0	114.0	146.0	174.0	5.0	156.0	31.7	15.8
12	116.0	149.0	120.0	147.0	117.0	124.0	127.0	122.0	147.0	176.0	10.0	134.5	19.5	6.5	128.0	162.0	119.0	151.0	148.0	5.0	141.6	17.6	8.8

Double-leg press @ 80% of NEW 1 RM (Post-training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	120.0	146.0	125.0	138.0	112.0	114.0	126.0	112.0	125.0	144.0	10.0	126.2	12.7	4.2	130.0	140.0	101.0	101.0	141.0	5.0	122.6	20.2	10.1
2	114.0	120.0	109.0	137.0	115.0	118.0	126.0	120.0	125.0	134.0	10.0	121.8	8.8	2.9	140.0	158.0	106.0	123.0	152.0	5.0	135.8	21.4	10.7
3	115.0	144.0	114.0	144.0	117.0	114.0	126.0	120.0	127.0	140.0	10.0	126.1	12.3	4.1	135.0	150.0	107.0	117.0	145.0	5.0	130.8	18.3	9.2
4	116.0	148.0	122.0	148.0	130.0	118.0	125.0	119.0	131.0	145.0	10.0	130.2	12.6	4.2	132.0	158.0	114.0	125.0	140.0	5.0	133.8	16.6	8.3
5	128.0	151.0	116.0	148.0	125.0	120.0	126.0	114.0	137.0	143.0	10.0	130.8	13.2	4.4	141.0	162.0	109.0	133.0	145.0	5.0	138.0	19.4	9.7
6	130.0	155.0	112.0	151.0	124.0	118.0	130.0	124.0	148.0	158.0	10.0	135.0	16.5	5.5	150.0	166.0	108.0	149.0	139.0	5.0	142.4	21.6	10.8
7	122.0	154.0	136.0	146.0	120.0	120.0	144.0	125.0	162.0	160.0	10.0	138.9	16.6	5.5	145.0	161.0	117.0	151.0	147.0	5.0	144.2	16.4	8.2
8	116.0	156.0	120.0	156.0	130.0	125.0	144.0	126.0	170.0	174.0	10.0	141.7	21.2	7.1	138.0	194.0	113.0	147.0	154.0	5.0	149.2	29.5	14.7
9	125.0	160.0	121.0	142.0	132.0	126.0	150.0	130.0	160.0	174.0	10.0	142.0	18.2	6.1	144.0	170.0	114.0	139.0	159.0	5.0	145.2	21.8	10.7
10	123.0	164.0	133.0	165.0	132.0	127.0	150.0	132.0	160.0	185.0	10.0	147.1	20.7	6.9	157.0	196.0	117.0	144.0	167.0	5.0	156.2	29.1	14.5
11	123.0	162.0	137.0	170.0	126.0	121.0	156.0	132.0	162.0	178.0	10.0	146.7	21.2	7.1	157.0	193.0	114.0	146.0	167.0	5.0	155.4	29.0	14.5
12	126.0	162.0	135.0	160.0	124.0	120.0	160.0	130.0	155.0	180.0	10.0	145.2	20.6	6.9	144.0	174.0	119.0	151.0	166.0	5.0	150.8	21.4	10.7

MAIN EFFECT TRAIN - $p < 0.043$

Double-leg press @ 80% 1 RM (Pre-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
145.0	164.0	153.0	176.0	142.0	153.0	139.0	135.0	179.0	158.0

N	MEAN	S.D.	SEM
10.0	154.4	15.0	5.0

CONTROL GROUP

A	B	C	D	E
176.0	171.0	130.0	162.0	170.0

N	MEAN	S.D.	SEM
5.0	161.8	18.5	9.2

Double-leg press @ 80% of ORIGINAL 1 RM (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
133.0	145.0	138.0	161.0	135.0	148.0	142.0	129.0	175.0	163.0

N	MEAN	S.D.	SEM
10.0	146.9	14.9	5.0

CONTROL GROUP

A	B	C	D	E
169.0	198.0	135.0	158.0	183.0

N	MEAN	S.D.	SEM
5.0	168.6	24.0	12.0

Double-leg press @ 80% of NEW 1 RM (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
139.0	163.0	143.0	171.0	148.0	159.0	149.0	139.0	184.0	165.0

N	MEAN	S.D.	SEM
10.0	156.0	14.9	5.0

CONTROL GROUP

A	B	C	D	E
177.0	201.0	135.0	158.0	180.0

N	MEAN	S.D.	SEM
5.0	170.2	24.9	12.4

Double-leg press @ 80% 1 RM (Pre-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	91.0	108.0	83.0	95.0	71.0	77.0	86.0	75.0	67.0	133.0	10.0	88.6	19.8	6.6	75.0	102.0	71.0	75.0	88.0	5.0	82.2	12.8	6.4
2	86.0	106.0	88.0	106.0	80.0	80.0	100.0	82.0	71.0	115.0	10.0	91.4	14.4	4.8	79.0	107.0	67.0	83.0	100.0	5.0	87.2	16.2	8.1
3	95.0	114.0	94.0	113.0	86.0	86.0	100.0	84.0	84.0	120.0	10.0	97.6	13.6	4.5	83.0	100.0	75.0	94.0	100.0	5.0	90.4	11.1	5.5
4	95.0	120.0	88.0	100.0	86.0	88.0	103.0	81.0	82.0	124.0	10.0	96.7	15.2	5.1	88.0	111.0	75.0	95.0	86.0	5.0	91.0	13.3	6.6
5	100.0	117.0	109.0	117.0	95.0	88.0	113.0	84.0	82.0	124.0	10.0	102.9	15.2	5.1	86.0	111.0	75.0	90.0	111.0	5.0	94.8	15.9	8.0
6	100.0	120.0	100.0	113.0	83.0	83.0	106.0	82.0	90.0	129.0	10.0	100.6	16.5	5.5	88.0	111.0	69.0	95.0	100.0	5.0	92.6	15.6	7.8
7	95.0	114.0	109.0	111.0	88.0	86.0	115.0	90.0	92.0	131.0	10.0	103.1	15.0	5.0	95.0	124.0	83.0	100.0	92.0	5.0	98.8	15.4	7.7
8	105.0	117.0	109.0	114.0	86.0	88.0	107.0	88.0	95.0	140.0	10.0	104.9	16.7	5.6	88.0	120.0	71.0	100.0	100.0	5.0	95.8	18.0	9.0
9	95.0	126.0	111.0	113.0	94.0	94.0	115.0	80.0	95.0	133.0	10.0	105.6	16.6	5.5	100.0	124.0	86.0	95.0	106.0	5.0	102.2	14.2	7.1
10	105.0	126.0	105.0	117.0	90.0	88.0	115.0	95.0	107.0	131.0	10.0	107.9	14.5	4.8	94.0	126.0	71.0	105.0	107.0	5.0	100.6	20.2	10.1
11	100.0	124.0	117.0	117.0	95.0	100.0	107.0	91.0	107.0	135.0	10.0	109.3	13.8	4.6	100.0	135.0	83.0	100.0	109.0	5.0	105.4	19.0	9.5
12	106.0	124.0	120.0	117.0	100.0	94.0	115.0	95.0	111.0	141.0	10.0	112.3	14.4	4.8	100.0	129.0	82.0	111.0	107.0	5.0	105.8	17.1	8.5

Double-leg press @ 80% of ORIGINAL 1 RM (Post-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	83.0	107.0	83.0	80.0	75.0	78.0	118.0	88.0	63.0	107.0	10.0	88.2	17.1	5.7	60.0	90.0	70.0	75.0	79.0	5.0	74.8	11.1	5.5
2	90.0	105.0	80.0	88.0	92.0	80.0	107.0	90.0	75.0	115.0	10.0	92.2	13.0	4.3	80.0	107.0	75.0	80.0	97.0	5.0	87.8	13.6	6.8
3	88.0	109.0	94.0	95.0	82.0	80.0	100.0	90.0	63.0	113.0	10.0	91.4	14.6	4.9	64.0	113.0	75.0	83.0	89.0	5.0	84.8	18.3	9.2
4	94.0	113.0	86.0	94.0	100.0	80.0	100.0	90.0	83.0	115.0	10.0	95.5	11.8	3.8	80.0	100.0	75.0	97.0	100.0	5.0	90.4	12.0	6.0
5	94.0	110.0	88.0	95.0	92.0	80.0	107.0	90.0	71.0	113.0	10.0	94.0	13.2	4.4	80.0	120.0	75.0	94.0	100.0	5.0	93.8	17.8	8.9
6	94.0	117.0	92.0	100.0	107.0	86.0	111.0	91.0	83.0	113.0	10.0	99.4	12.0	4.0	80.0	113.0	79.0	90.0	92.0	5.0	90.8	13.7	6.9
7	95.0	113.0	88.0	95.0	100.0	80.0	103.0	90.0	83.0	120.0	10.0	96.7	12.7	4.2	80.0	124.0	83.0	94.0	107.0	5.0	97.6	18.2	9.1
8	94.0	117.0	95.0	100.0	100.0	91.0	103.0	90.0	88.0	124.0	10.0	100.2	11.8	3.9	86.0	120.0	79.0	100.0	100.0	5.0	97.0	15.7	7.9
9	92.0	117.0	88.0	105.0	107.0	86.0	111.0	95.0	83.0	120.0	10.0	100.4	13.3	4.4	86.0	131.0	83.0	95.0	100.0	5.0	99.0	19.1	9.6
10	95.0	111.0	100.0	106.0	100.0	86.0	113.0	82.0	86.0	120.0	10.0	99.9	12.8	4.3	92.0	130.0	75.0	106.0	100.0	5.0	100.6	20.1	10.1
11	94.0	120.0	100.0	105.0	109.0	86.0	107.0	88.0	94.0	120.0	10.0	102.3	12.1	4.0	88.0	125.0	88.0	95.0	113.0	5.0	101.8	16.5	8.3
12	106.0	118.0	100.0	104.0	100.0	88.0	117.0	94.0	80.0	123.0	10.0	103.0	13.7	4.6	86.0	138.0	89.0	108.0	100.0	5.0	104.2	20.8	10.4

Double-leg press @ 80% of NEW 1 RM (Post-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	92.0	104.0	85.0	92.0	90.0	78.0	92.0	86.0	67.0	135.0	10.0	92.1	18.0	6.0	77.0	100.0	70.0	75.0	88.0	5.0	82.0	12.0	6.0
2	94.0	117.0	83.0	106.0	90.0	77.0	100.0	94.0	79.0	115.0	10.0	95.5	14.1	4.7	80.0	100.0	75.0	80.0	100.0	5.0	87.0	12.0	6.0
3	94.0	117.0	94.0	106.0	96.0	94.0	100.0	90.0	79.0	125.0	10.0	99.5	13.4	4.5	80.0	92.0	75.0	83.0	92.0	5.0	84.4	7.5	3.8
4	100.0	117.0	97.0	106.0	96.0	86.0	100.0	95.0	79.0	120.0	10.0	99.6	12.5	4.2	75.0	113.0	75.0	97.0	92.0	5.0	90.4	16.1	8.0
5	94.0	123.0	100.0	106.0	100.0	94.0	120.0	95.0	88.0	130.0	10.0	105.0	14.4	4.8	80.0	120.0	75.0	94.0	107.0	5.0	95.2	18.7	9.3
6	105.0	125.0	100.0	111.0	97.0	100.0	107.0	94.0	94.0	107.0	10.0	104.0	9.4	3.1	86.0	120.0	79.0	90.0	92.0	5.0	93.4	15.7	7.8
7	100.0	117.0	106.0	113.0	100.0	95.0	107.0	91.0	97.0	129.0	10.0	105.5	11.5	3.8	86.0	120.0	83.0	94.0	107.0	5.0	98.0	15.4	7.7
8	94.0	122.0	120.0	111.0	105.0	94.0	120.0	100.0	95.0	120.0	10.0	108.1	11.9	4.0	94.0	140.0	79.0	100.0	92.0	5.0	101.0	23.1	11.6
9	113.0	125.0	100.0	117.0	106.0	100.0	113.0	100.0	106.0	131.0	10.0	111.1	10.8	3.6	86.0	120.0	83.0	95.0	107.0	5.0	98.2	15.4	7.7
10	100.0	130.0	109.0	117.0	106.0	100.0	115.0	100.0	107.0	140.0	10.0	112.4	13.5	4.5	86.0	140.0	75.0	106.0	107.0	5.0	102.8	24.8	12.4
11	106.0	127.0	109.0	126.0	105.0	92.0	113.0	95.0	107.0	141.0	10.0	112.1	15.2	5.1	100.0	141.0	88.0	95.0	107.0	5.0	106.2	20.7	10.3
12	106.0	128.0	114.0	125.0	107.0	106.0	114.0	100.0	100.0	141.0	10.0	114.1	13.4	4.5	90.0	142.0	89.0	108.0	107.0	5.0	107.2	21.4	10.7

Double-leg press @ 80% 1 RM (Pre-training)
Rate-Pressure Product

REP.#	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	20.4	26.8	16.5	22.1	13.6	16.5	17.1	15.2	16.5	31.6	10.0	19.6	5.7	1.9	16.5	19.5	13.9	15.5	22.2	5.0	17.5	3.8	1.7
2	18.3	23.9	17.8	25.0	14.6	17.7	16.8	15.5	16.3	23.0	10.0	18.9	3.7	1.2	17.8	22.8	12.9	16.3	23.6	5.0	18.7	4.5	2.3
3	19.0	25.2	18.8	25.1	17.1	20.0	18.4	16.2	19.8	26.4	10.0	20.6	3.6	1.2	19.1	21.4	14.8	18.3	23.8	5.0	19.5	3.4	1.7
4	19.1	27.4	18.2	23.0	16.5	19.8	20.0	16.0	20.9	26.2	10.0	20.7	3.8	1.3	20.2	26.6	14.8	20.7	21.2	5.0	20.7	4.2	2.1
5	20.9	27.8	22.4	27.7	18.5	19.7	21.8	16.5	23.0	27.2	10.0	22.5	3.9	1.3	19.5	26.6	15.1	20.1	27.5	5.0	21.8	5.2	2.6
6	21.0	28.1	21.7	27.0	17.4	18.9	21.2	16.9	25.1	29.3	10.0	22.7	4.5	1.5	20.6	27.3	14.1	21.8	25.4	5.0	21.8	5.1	2.5
7	20.1	26.6	23.6	27.1	17.8	19.8	25.3	17.9	23.8	30.2	10.0	23.2	4.2	1.4	21.4	31.6	16.8	25.9	24.1	5.0	24.0	5.5	2.7
8	23.2	27.0	23.0	26.7	17.9	20.9	24.8	18.2	26.4	33.6	10.0	24.2	4.7	1.6	20.5	30.8	13.8	25.4	26.2	5.0	23.3	6.5	3.2
9	21.0	31.7	25.3	26.6	19.8	22.4	25.3	16.7	27.0	32.8	10.0	24.9	5.1	1.7	24.5	32.7	17.1	23.8	28.8	5.0	25.4	5.9	2.9
10	23.5	31.1	25.8	28.1	18.5	21.0	25.4	19.8	31.7	32.6	10.0	25.7	5.1	1.7	23.2	35.1	14.1	28.4	29.3	5.0	26.0	7.9	4.0
11	22.5	31.8	26.6	28.7	20.0	23.9	25.5	19.8	31.7	34.6	10.0	26.5	5.1	1.7	24.8	36.5	17.1	28.8	29.8	5.0	27.4	7.1	3.6
12	24.5	32.0	28.8	29.6	20.8	22.4	25.6	20.3	33.2	37.8	10.0	27.5	5.8	1.9	25.3	33.2	17.8	30.1	29.1	5.0	27.1	5.9	3.0

Double-leg press @ 80% of ORIGINAL 1 RM (Post-training)
Rate-Pressure Product

REP.#	WTTRAIN GROUP														CONTROL GROUP									
	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	16.9	23.9	16.4	17.2	13.6	17.3	24.6	17.4	15.6	27.4	10.0	19.0	4.6	1.5	15.3	22.1	14.5	14.0	19.3	5.0	17.0	3.6	1.6
2	16.7	21.0	14.9	20.3	17.1	18.0	22.1	18.1	18.8	27.9	10.0	19.5	3.7	1.2	17.3	26.8	14.3	16.1	23.1	5.0	19.5	5.8	2.6
3	16.6	21.6	19.0	20.2	16.2	18.2	20.4	19.4	15.5	27.2	10.0	19.4	3.4	1.1	13.7	28.5	14.6	17.2	21.5	5.0	19.1	6.0	3.0
4	18.2	22.5	16.7	19.4	18.8	18.5	19.5	17.9	21.6	28.9	10.0	20.2	3.5	1.2	17.4	26.5	15.4	22.1	24.3	5.0	21.1	4.6	2.3
5	18.4	22.7	17.1	19.8	16.6	18.5	22.6	18.6	19.0	26.6	10.0	20.0	3.1	1.0	18.2	32.3	14.9	21.1	24.5	5.0	22.2	6.6	3.3
6	19.0	24.8	17.7	21.0	20.3	20.1	22.0	19.2	22.4	28.5	10.0	21.5	3.2	1.1	17.7	31.1	16.0	23.0	23.5	5.0	22.3	5.9	2.9
7	18.9	24.0	17.0	20.1	18.8	18.7	21.8	18.9	22.8	31.9	10.0	21.3	4.3	1.4	17.4	35.0	17.3	22.9	28.0	5.0	24.1	7.5	3.8
8	18.9	25.8	18.8	21.6	19.2	21.9	22.5	18.9	24.4	31.8	10.0	22.4	4.1	1.4	19.2	33.8	16.3	25.5	26.0	5.0	24.2	6.8	3.4
9	18.7	26.8	17.9	23.3	21.2	20.3	25.0	19.6	22.8	30.4	10.0	22.6	3.9	1.3	19.0	37.4	17.3	24.3	26.3	5.0	24.8	7.9	4.0
10	19.6	25.4	20.2	24.0	19.7	20.7	24.3	17.2	23.7	30.5	10.0	22.5	3.8	1.3	21.6	37.8	15.8	26.7	26.7	5.0	25.7	8.1	4.1
11	19.4	27.8	20.0	24.5	21.5	21.1	25.1	19.1	26.2	32.8	10.0	23.7	4.4	1.5	21.4	35.9	19.0	24.7	30.7	5.0	26.3	6.9	3.5
12	22.5	27.9	21.2	23.9	20.1	21.3	25.7	19.9	22.4	33.5	10.0	23.8	4.2	1.4	20.1	40.0	19.1	27.8	27.9	5.0	27.0	8.4	4.2

GROUPxREP. INTERACTION - $p < 0.024$; TRAINxREP. INTERACTION - $p < 0.018$

Double-leg press @ 80% of NEW 1 RM (Post-training)
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	18.7	22.4	16.0	21.7	17.1	16.3	20.0	18.2	16.8	32.1	10.0	19.9	4.8	1.6	17.0	26.9	14.5	14.0	21.7	5.0	18.8	5.5	2.7
2	18.1	23.2	15.4	22.9	16.2	17.1	19.8	20.5	19.1	25.1	10.0	19.7	3.2	1.1	17.8	26.4	14.3	16.1	24.3	5.0	19.8	5.3	2.7
3	18.5	25.3	17.7	23.1	18.1	22.0	18.6	18.9	19.4	26.3	10.0	20.8	3.2	1.1	17.6	25.4	14.6	17.3	23.0	5.0	19.6	4.5	2.2
4	20.3	26.0	18.7	24.1	19.3	20.1	19.8	20.0	19.8	26.6	10.0	21.5	2.9	1.0	17.3	31.2	15.4	22.1	23.3	5.0	21.8	6.2	3.1
5	19.2	28.3	19.0	24.0	21.3	21.3	22.8	20.7	23.9	29.9	10.0	23.0	3.6	1.2	18.2	33.2	14.9	21.2	26.5	5.0	22.8	7.2	3.6
6	22.6	29.3	20.8	25.4	21.0	23.6	22.5	20.3	25.2	26.1	10.0	23.7	2.8	0.9	19.7	34.2	16.0	23.0	22.7	5.0	23.1	6.8	3.4
7	21.5	28.1	23.0	27.0	22.2	22.8	23.5	20.3	26.2	33.5	10.0	24.8	4.0	1.3	20.1	34.6	17.2	22.9	27.8	5.0	24.5	6.8	3.4
8	20.9	30.3	26.4	25.9	24.4	22.7	26.3	22.6	27.0	31.0	10.0	25.7	3.2	1.1	22.6	39.5	16.3	25.5	24.8	5.0	25.7	8.5	4.3
9	24.2	32.5	22.4	27.9	24.2	24.3	25.4	23.2	29.3	34.1	10.0	26.7	4.0	1.3	20.6	34.8	17.2	24.3	28.7	5.0	25.1	6.9	3.4
10	21.6	34.2	24.9	28.1	24.4	24.6	26.5	23.0	30.2	37.0	10.0	27.4	5.0	1.7	21.2	41.2	15.8	26.7	29.3	5.0	26.8	9.6	4.8
11	23.4	34.3	23.7	31.0	24.5	22.1	28.5	21.9	30.8	38.5	10.0	27.9	5.7	1.9	24.6	43.0	18.9	24.8	30.1	5.0	28.3	9.1	4.6
12	23.6	34.6	27.1	31.3	24.9	25.3	27.7	23.2	29.0	39.5	10.0	28.6	5.2	1.7	22.1	43.6	19.1	27.8	30.9	5.0	28.7	9.5	4.8

Single-leg press @ 80% 1 RM (Pre-training)
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	203.0	210.0	205.0	241.0	188.0	203.0	188.0	192.0	254.0	208.0	10.0	209.2	21.9	7.3	228.0	212.0	210.0	210.0	233.0	5.0	218.6	11.0	5.5
2	192.0	215.0	214.0	236.0	187.0	203.0	175.0	182.0	238.0	214.0	10.0	205.6	21.7	7.2	222.0	208.0	183.0	205.0	240.0	5.0	211.6	21.1	10.6
3	200.0	206.0	215.0	228.0	196.0	202.0	200.0	185.0	244.0	212.0	10.0	208.8	17.0	5.7	220.0	216.0	188.0	216.4	243.0	5.0	216.4	19.6	9.8
4	194.0	201.0	219.0	233.0	195.0	218.0	200.0	197.0	244.0	199.0	10.0	210.0	17.6	5.9	230.0	234.0	183.0	217.3	240.0	5.0	220.8	22.8	11.4
5	205.0	211.0	221.0	245.0	205.0	214.0	204.0	191.0	252.0	212.0	10.0	216.0	18.9	6.3	223.0	234.0	191.0	217.0	240.0	5.0	221.0	19.0	9.5
6	200.0	220.0	219.0	235.0	203.0	217.0	199.0	192.0	258.0	217.0	10.0	216.0	19.6	6.5	229.0	247.0	192.0	215.0	241.0	5.0	224.8	22.0	11.0
7	212.0	220.0	234.0	241.0	204.0	220.0	213.0	199.0	264.0	217.0	10.0	222.4	19.2	6.4	241.0	230.0	191.0	216.0	248.0	5.0	225.2	22.6	11.3
8	212.0	222.0	230.0	244.0	211.0	219.0	207.0	190.0	280.0	209.0	10.0	222.4	24.9	8.3	240.0	237.0	187.0	220.0	247.0	5.0	226.2	24.1	12.0
9	208.0	215.0	237.0	238.0	216.0	221.0	200.0	205.0	295.0	212.0	10.0	224.7	27.7	9.2	244.0	245.0	199.0	220.0	252.0	5.0	232.0	22.1	11.0
10	205.0	214.0	246.0	241.0	215.0	217.0	200.0	196.0	283.0	215.0	10.0	223.2	26.4	8.8	260.0	243.0	197.0	234.0	254.0	5.0	237.6	24.8	12.4
11	224.0	223.0	249.0	243.0	207.0	218.0	198.0	195.0	291.0	220.0	10.0	226.8	28.4	9.5	265.0	251.0	202.0	228.0	256.0	5.0	240.4	25.4	12.7
12	232.0	235.0	261.0	248.0	227.0	218.0	200.0	208.0	297.0	222.0	10.0	234.8	28.2	9.4	263.0	259.0	205.0	244.0	264.0	5.0	247.0	24.8	12.4

Single-leg press @ 80% of ORIGINAL 1 RM (Post-training)
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	191.0	215.0	200.0	252.0	200.0	222.0	182.0	207.0	229.0	194.0	10.0	209.2	20.8	6.9	203.0	270.0	188.0	185.0	219.0	5.0	213.0	34.6	17.3
2	185.0	196.0	208.0	213.0	176.0	208.0	185.0	202.0	231.0	193.0	10.0	199.7	16.2	5.4	205.0	220.0	182.0	189.0	220.0	5.0	203.2	17.5	8.7
3	176.0	188.0	208.0	215.0	203.0	213.0	180.0	203.0	240.0	191.0	10.0	201.7	19.0	6.3	213.0	221.0	184.0	196.0	232.0	5.0	209.2	19.3	9.6
4	172.0	192.0	202.0	215.0	198.0	212.0	179.0	210.0	250.0	204.0	10.0	203.4	21.5	7.2	213.0	248.0	192.0	202.0	234.0	5.0	217.8	23.0	11.5
5	182.0	199.0	202.0	220.0	197.0	222.0	183.0	210.0	255.0	217.0	10.0	208.7	21.5	7.2	226.0	254.0	184.0	213.0	232.0	5.0	221.8	25.8	12.9
6	193.0	196.0	208.0	223.0	204.0	215.0	195.0	217.0	257.0	211.0	10.0	211.9	18.8	6.3	230.0	253.0	194.0	223.0	234.0	5.0	226.8	21.4	10.7
7	185.0	208.0	211.0	220.0	209.0	218.0	198.0	213.0	268.0	214.0	10.0	214.4	21.4	7.1	221.0	265.0	194.0	219.0	240.0	5.0	227.8	26.5	13.2
8	185.0	208.0	213.0	227.0	193.0	223.0	205.0	217.0	265.0	215.0	10.0	215.1	21.7	7.2	228.0	257.0	194.0	224.0	242.0	5.0	229.0	23.5	11.7
9	185.0	213.0	218.0	226.0	210.0	222.0	205.0	222.0	266.0	210.0	10.0	217.7	20.8	6.9	228.0	262.0	199.0	216.0	242.0	5.0	229.4	24.1	12.1
10	195.0	214.0	215.0	226.0	197.0	222.0	208.0	222.0	258.0	206.0	10.0	216.3	18.0	6.0	238.0	269.0	200.0	217.0	245.0	5.0	233.8	26.5	13.2
11	192.0	219.0	221.0	230.0	214.0	224.0	210.0	229.0	265.0	222.0	10.0	222.6	18.5	6.2	240.0	264.0	206.0	226.0	249.0	5.0	237.0	22.2	11.1
12	195.0	227.0	222.0	232.0	207.0	222.0	205.0	231.0	279.0	231.0	10.0	225.1	22.8	7.6	239.0	283.0	202.0	224.0	250.0	5.0	239.6	30.2	15.1

Single-leg press @ 80% of NEW 1 RM (Post-training)
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	207.0	220.0	201.0	220.0	162.0	230.0	204.0	197.0	215.0	228.0	10.0	208.4	19.8	6.6	203.0	260.0	188.0	185.0	219.0	5.0	211.0	30.6	15.3
2	198.0	210.0	209.0	200.0	174.0	216.0	168.0	199.0	234.0	202.0	10.0	201.0	19.1	6.4	205.0	257.0	182.0	189.0	220.0	5.0	210.6	29.8	14.9
3	191.0	212.0	201.0	205.0	175.0	215.0	174.0	212.0	253.0	198.0	10.0	203.6	22.6	7.5	213.0	273.0	184.0	196.0	232.0	5.0	219.6	34.9	17.5
4	190.0	220.0	202.0	213.0	180.0	207.0	179.0	205.0	259.0	200.0	10.0	205.5	23.0	7.7	213.0	266.0	192.0	202.0	234.0	5.0	221.4	29.4	14.7
5	191.0	217.0	203.0	218.0	186.0	222.0	185.0	215.0	263.0	220.0	10.0	212.0	23.0	7.7	226.0	268.0	184.0	213.0	232.0	5.0	224.6	30.5	15.3
6	191.0	220.0	213.0	215.0	189.0	225.0	193.0	216.0	258.0	230.0	10.0	215.0	20.9	7.0	230.0	278.0	194.0	223.0	234.0	5.0	231.8	30.2	15.1
7	196.0	221.0	212.0	222.0	194.0	225.0	207.0	212.0	265.0	225.0	10.0	217.9	20.0	6.7	221.0	275.0	194.0	219.0	240.0	5.0	229.8	30.1	15.0
8	206.0	229.0	231.0	230.0	200.0	226.0	213.0	222.0	266.0	230.0	10.0	225.3	18.0	6.0	228.0	280.0	194.0	224.0	242.0	5.0	233.6	31.3	15.6
9	206.0	232.0	233.0	241.0	199.0	231.0	210.0	221.0	272.0	238.0	10.0	228.3	21.0	7.0	228.0	284.0	199.0	216.0	242.0	5.0	233.8	32.2	16.1
10	207.0	232.0	249.0	242.0	220.0	232.0	212.0	230.0	292.0	245.0	10.0	236.1	24.0	8.0	238.0	290.0	200.0	217.0	245.0	5.0	238.0	34.1	17.0
11	207.0	230.0	246.0	243.0	234.0	240.0	220.0	234.0	310.0	245.0	10.0	240.9	27.1	9.0	240.0	296.0	206.0	226.0	249.0	5.0	243.4	33.6	16.8
12	213.0	232.0	242.0	255.0	241.0	237.0	223.0	232.0	282.0	250.0	10.0	240.7	19.0	6.3	239.0	290.0	202.0	224.0	250.0	5.0	241.0	32.8	16.4

Single–leg press @ 80% 1 RM (Pre–training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	135.0	140.0	127.0	148.0	109.0	105.0	125.0	115.0	122.0	119.0	10.0	124.5	13.6	4.5	157.0	135.0	129.0	119.0	122.0	5.0	132.4	15.1	7.5
2	117.0	128.0	111.0	153.0	103.0	98.0	107.0	104.0	116.0	123.0	10.0	116.0	16.0	5.3	123.0	125.0	105.0	111.0	128.0	5.0	118.4	9.9	4.9
3	121.0	141.0	123.0	137.0	117.0	101.0	120.0	110.0	128.0	117.0	10.0	121.5	11.8	3.9	135.0	110.0	98.0	124.0	134.0	5.0	120.2	16.0	8.0
4	108.0	140.0	139.0	145.0	116.0	116.0	116.0	111.0	123.0	117.0	10.0	123.1	13.3	4.4	129.0	117.0	101.0	123.0	133.0	5.0	120.6	12.5	6.3
5	116.0	130.0	130.0	154.0	121.0	113.0	116.0	105.0	131.0	120.0	10.0	123.6	13.6	4.5	140.0	141.0	106.0	119.0	128.0	5.0	126.8	14.8	7.4
6	124.0	138.0	134.0	148.0	106.0	117.0	125.0	109.0	131.0	126.0	10.0	125.8	12.9	4.3	137.0	121.0	105.0	112.0	134.0	5.0	121.8	13.8	6.9
7	127.0	140.0	141.0	151.0	118.0	110.0	129.0	114.0	132.0	117.0	10.0	127.9	13.3	4.4	141.0	120.0	104.0	113.0	140.0	5.0	123.6	16.4	8.2
8	133.0	133.0	141.0	151.0	111.0	106.0	119.0	106.0	138.0	122.0	10.0	126.0	15.6	5.2	151.0	125.0	99.0	123.0	143.0	5.0	128.2	20.2	10.1
9	132.0	123.0	154.0	136.0	111.0	109.0	121.0	113.0	156.0	115.0	10.0	127.0	17.2	5.7	159.0	123.0	111.0	121.0	135.0	5.0	129.8	18.4	9.2
10	128.0	138.0	166.0	138.0	112.0	109.0	119.0	95.0	148.0	121.0	10.0	127.4	20.8	6.9	155.0	139.0	107.0	135.0	138.0	5.0	134.8	17.4	8.7
11	122.0	141.0	156.0	144.0	111.0	108.0	125.0	106.0	152.0	123.0	10.0	128.8	18.3	6.1	160.0	149.0	111.0	129.0	145.0	5.0	138.8	19.1	9.6
12	134.0	150.0	161.0	148.0	125.0	109.0	119.0	115.0	156.0	117.0	10.0	133.4	19.0	6.3	154.0	158.0	115.0	129.0	139.0	5.0	139.0	17.8	8.9

Single–leg press @ 80% of ORIGINAL 1 RM (Post–training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	105.0	148.0	125.0	123.0	113.0	96.0	112.0	103.0	112.0	111.0	10.0	114.8	14.5	4.8	118.0	162.0	105.0	101.0	121.0	5.0	121.4	24.2	12.1
2	101.0	123.0	114.0	128.0	107.0	100.0	106.0	108.0	104.0	107.0	10.0	109.8	9.2	3.1	114.0	118.0	100.0	102.0	124.0	5.0	111.6	10.3	5.2
3	93.0	114.0	111.0	126.0	120.0	96.0	99.0	99.0	111.0	108.0	10.0	107.7	10.8	3.6	113.0	130.0	100.0	104.0	131.0	5.0	115.6	14.4	7.2
4	94.0	115.0	107.0	123.0	120.0	104.0	101.0	99.0	132.0	116.0	10.0	111.1	12.0	4.0	128.0	144.0	104.0	110.0	133.0	5.0	123.8	16.5	8.3
5	99.0	116.0	111.0	126.0	114.0	107.0	108.0	106.0	120.0	126.0	10.0	113.3	8.9	3.0	130.0	157.0	103.0	123.0	130.0	5.0	128.6	19.3	9.7
6	107.0	123.0	116.0	129.0	125.0	105.0	112.0	102.0	124.0	116.0	10.0	115.9	9.3	3.1	127.0	155.0	105.0	119.0	129.0	5.0	127.0	18.3	9.1
7	99.0	126.0	114.0	124.0	126.0	108.0	113.0	102.0	126.0	125.0	10.0	116.3	10.6	3.5	126.0	142.0	101.0	130.0	131.0	5.0	126.0	15.2	7.6
8	99.0	126.0	117.0	129.0	115.0	108.0	114.0	107.0	131.0	134.0	10.0	118.0	11.6	3.9	139.0	142.0	104.0	125.0	131.0	5.0	128.2	15.1	7.5
9	100.0	133.0	124.0	128.0	124.0	107.0	115.0	108.0	133.0	120.0	10.0	119.2	11.4	3.8	126.0	145.0	106.0	120.0	138.0	5.0	127.0	15.3	7.6
10	111.0	133.0	120.0	126.0	120.0	102.0	116.0	105.0	132.0	127.0	10.0	119.2	10.7	3.6	142.0	160.0	106.0	115.0	133.0	5.0	131.2	21.5	10.7
11	105.0	133.0	127.0	133.0	127.0	106.0	123.0	114.0	132.0	127.0	10.0	122.7	10.7	3.6	143.0	153.0	114.0	122.0	138.0	5.0	134.0	15.8	7.9
12	107.0	139.0	127.0	130.0	122.0	105.0	112.0	114.0	143.0	132.0	10.0	123.1	13.3	4.4	133.0	158.0	106.0	119.0	129.0	5.0	129.0	19.3	9.6

Single-leg press @ 80% of NEW 1 RM (Post-training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	123.0	133.0	125.0	125.0	120.0	125.0	120.0	108.0	107.0	110.0	10.0	119.6	8.6	2.9	118.0	160.0	105.0	101.0	121.0	5.0	121.0	23.4	11.7
2	112.0	126.0	125.0	127.0	110.0	114.0	92.0	100.0	130.0	125.0	10.0	116.1	12.8	4.3	114.0	151.0	100.0	102.0	124.0	5.0	118.2	20.7	10.4
3	107.0	144.0	111.0	130.0	116.0	108.0	100.0	120.0	125.0	120.0	10.0	118.1	12.8	4.3	113.0	154.0	100.0	104.0	131.0	5.0	120.4	22.3	11.1
4	106.0	145.0	116.0	137.0	112.0	105.0	104.0	110.0	125.0	130.0	10.0	119.0	14.5	4.8	128.0	146.0	104.0	110.0	133.0	5.0	124.2	17.2	8.6
5	110.0	134.0	117.0	142.0	112.0	107.0	108.0	120.0	138.0	127.0	10.0	121.5	13.0	4.3	130.0	154.0	103.0	123.0	130.0	5.0	128.0	18.3	9.1
6	111.0	150.0	133.0	134.0	126.0	108.0	122.0	112.0	134.0	126.0	10.0	125.6	13.0	4.3	127.0	147.0	105.0	119.0	129.0	5.0	125.4	15.3	7.7
7	115.0	144.0	131.0	139.0	129.0	112.0	120.0	114.0	134.0	120.0	10.0	125.8	11.2	3.7	126.0	166.0	101.0	130.0	131.0	5.0	130.8	23.2	11.6
8	123.0	144.0	125.0	150.0	122.0	110.0	127.0	123.0	143.0	130.0	10.0	129.7	12.3	4.1	139.0	166.0	104.0	125.0	131.0	5.0	133.0	22.5	11.3
9	114.0	145.0	125.0	150.0	124.0	110.0	128.0	123.0	145.0	134.0	10.0	129.8	13.5	4.5	126.0	152.0	106.0	120.0	138.0	5.0	128.4	17.5	8.8
10	118.0	150.0	150.0	151.0	127.0	115.0	130.0	129.0	151.0	134.0	10.0	135.5	14.0	4.7	142.0	153.0	106.0	115.0	133.0	5.0	129.8	19.3	9.6
11	122.0	154.0	147.0	160.0	125.0	114.0	131.0	132.0	164.0	132.0	10.0	138.1	17.1	5.7	143.0	171.0	114.0	122.0	138.0	5.0	137.6	22.1	11.0
12	124.0	150.0	127.0	162.0	137.0	118.0	132.0	130.0	160.0	135.0	10.0	137.5	15.0	5.0	133.0	166.0	106.0	119.0	129.0	5.0	130.6	22.4	11.2

Single-leg press @ 80% 1 RM (Pre-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
128.0	148.0	154.0	178.0	136.0	142.0	135.0	131.0	176.0	140.0	10.0	146.8	17.7	5.9

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
177.0	160.0	129.0	155.0	169.0	5.0	158.0	18.3	9.1

Single-leg press @ 80% of ORIGINAL 1 RM (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
124.0	137.0	140.0	157.0	135.0	139.0	139.0	129.0	166.0	141.0	10.0	140.7	12.4	4.1

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
171.0	175.0	130.0	143.0	173.0	5.0	158.4	20.6	10.3

Single-leg press @ 80% of NEW 1 RM (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
132.0	151.0	139.0	165.0	140.0	146.0	139.0	137.0	178.0	145.0	10.0	147.2	14.2	4.7

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
171.0	180.0	130.0	143.0	173.0	5.0	159.4	21.7	10.8

Single-leg press @ 80% 1 RM (Pre-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	75.0	100.0	86.0	100.0	53.0	75.0	88.0	80.0	64.0	127.0	10.0	84.8	20.9	7.0	79.0	75.0	75.0	88.0	79.0	5.0	79.2	5.3	2.7
2	100.0	111.0	92.0	105.0	60.0	80.0	100.0	79.0	71.0	113.0	10.0	91.1	17.9	6.0	83.0	90.0	67.0	89.0	92.0	5.0	84.2	10.2	5.1
3	90.0	111.0	86.0	105.0	75.0	88.0	113.0	83.0	92.0	114.0	10.0	95.7	13.9	4.6	95.0	95.0	82.0	86.0	94.0	5.0	90.4	6.0	3.0
4	95.0	117.0	98.0	106.0	83.0	81.0	107.0	81.0	78.0	113.0	10.0	95.9	14.5	4.8	88.0	86.0	75.0	88.0	92.0	5.0	85.8	6.4	3.2
5	105.0	111.0	93.0	109.0	79.0	88.0	100.0	75.0	78.0	120.0	10.0	95.8	15.6	5.2	90.0	114.0	67.0	95.0	94.0	5.0	92.0	16.8	8.4
6	100.0	111.0	100.0	105.0	79.0	79.0	107.0	86.0	77.0	113.0	10.0	95.7	14.1	4.7	95.0	105.0	83.0	83.0	100.0	5.0	93.2	10.0	5.0
7	100.0	120.0	96.0	114.0	90.0	88.0	106.0	84.0	84.0	124.0	10.0	100.6	14.8	4.9	94.0	117.0	75.0	88.0	100.0	5.0	94.8	15.5	7.7
8	106.0	117.0	110.0	113.0	83.0	88.0	106.0	75.0	82.0	117.0	10.0	99.7	16.0	5.3	95.0	117.0	71.0	90.0	100.0	5.0	94.6	16.7	8.3
9	111.0	114.0	107.0	111.0	79.0	80.0	103.0	86.0	80.0	113.0	10.0	98.4	15.2	5.1	100.0	124.0	60.0	86.0	94.0	5.0	92.8	23.2	11.6
10	111.0	117.0	114.0	110.0	90.0	92.0	115.0	100.0	95.0	124.0	10.0	106.8	11.7	3.9	95.0	111.0	100.0	88.0	100.0	5.0	98.8	8.4	4.2
11	103.0	120.0	117.0	117.0	88.0	100.0	100.0	90.0	91.0	120.0	10.0	104.6	12.9	4.3	105.0	126.0	75.0	88.0	100.0	5.0	98.8	19.1	9.6
12	114.0	124.0	118.0	106.0	95.0	86.0	120.0	84.0	92.0	124.0	10.0	106.3	15.8	5.3	104.0	127.0	75.0	94.0	100.0	5.0	100.0	18.7	9.4

Single-leg press @ 80% of ORIGINAL 1 RM (Post-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	83.0	108.0	103.0	90.0	88.0	72.0	100.0	84.0	60.0	95.0	10.0	88.3	14.5	4.8	79.0	86.0	67.0	79.0	75.0	5.0	77.2	6.9	3.5
2	94.0	106.0	83.0	94.0	92.0	75.0	100.0	95.0	57.0	107.0	10.0	90.3	15.2	5.1	75.0	100.0	80.0	86.0	92.0	5.0	86.6	9.8	4.9
3	90.0	112.0	81.0	106.0	92.0	75.0	106.0	80.0	64.0	92.0	10.0	89.8	15.2	5.1	80.0	106.0	60.0	80.0	94.0	5.0	84.0	17.3	8.6
4	90.0	108.0	88.0	94.0	100.0	80.0	106.0	89.0	73.0	100.0	10.0	92.8	11.1	3.7	86.0	107.0	75.0	86.0	92.0	5.0	89.2	11.7	5.8
5	83.0	108.0	79.0	95.0	100.0	75.0	107.0	91.0	63.0	106.0	10.0	90.7	15.3	5.1	75.0	120.0	71.0	83.0	82.0	5.0	86.2	19.5	9.8
6	88.0	113.0	83.0	106.0	100.0	73.0	100.0	86.0	71.0	107.0	10.0	92.7	14.6	4.9	80.0	124.0	83.0	90.0	100.0	5.0	95.4	17.7	8.9
7	88.0	113.0	79.0	100.0	100.0	83.0	115.0	94.0	67.0	100.0	10.0	93.9	15.0	5.0	83.0	120.0	75.0	90.0	92.0	5.0	92.0	17.0	8.5
8	95.0	114.0	83.0	95.0	100.0	71.0	100.0	88.0	75.0	106.0	10.0	92.7	13.5	4.5	83.0	126.0	75.0	84.0	94.0	5.0	92.4	20.0	10.0
9	88.0	115.0	86.0	106.0	100.0	80.0	106.0	88.0	79.0	106.0	10.0	95.4	12.7	4.2	94.0	120.0	75.0	90.0	92.0	5.0	94.2	16.3	8.1
10	88.0	117.0	88.0	100.0	107.0	75.0	113.0	83.0	88.0	107.0	10.0	96.6	14.1	4.7	83.0	125.0	75.0	83.0	94.0	5.0	92.0	19.6	9.8
11	95.0	113.0	100.0	113.0	109.0	80.0	113.0	88.0	80.0	100.0	10.0	99.1	13.1	4.4	75.0	123.0	86.0	86.0	92.0	5.0	92.4	18.2	9.1
12	91.0	118.0	88.0	100.0	100.0	75.0	100.0	90.0	80.0	115.0	10.0	95.7	13.8	4.6	86.0	129.0	80.0	89.0	100.0	5.0	96.8	19.4	9.7

TRAINxREP. INTERACTION - $p < 0.011$

Single-leg press @ 80% of NEW 1 RM (Post-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	86.0	109.0	83.0	90.0	64.0	75.0	94.0	79.0	67.0	100.0	10.0	84.7	14.2	4.7	79.0	83.0	67.0	79.0	75.0	5.0	76.6	6.1	3.0
2	94.0	108.0	86.0	95.0	83.0	79.0	100.0	79.0	75.0	106.0	10.0	90.5	11.8	3.9	75.0	88.0	80.0	86.0	92.0	5.0	84.2	6.7	3.4
3	95.0	109.0	81.0	106.0	97.0	83.0	107.0	92.0	72.0	94.0	10.0	93.6	12.1	4.0	80.0	100.0	60.0	80.0	94.0	5.0	82.8	15.5	7.7
4	94.0	117.0	80.0	95.0	90.0	83.0	94.0	88.0	72.0	107.0	10.0	92.0	13.0	4.3	86.0	100.0	75.0	86.0	92.0	5.0	87.8	9.2	4.6
5	94.0	114.0	83.0	100.0	97.0	88.0	105.0	83.0	75.0	124.0	10.0	96.3	15.1	5.0	75.0	106.0	71.0	83.0	82.0	5.0	83.4	13.6	6.8
6	106.0	114.0	88.0	109.0	95.0	83.0	104.0	88.0	83.0	117.0	10.0	98.7	12.9	4.3	80.0	106.0	83.0	90.0	100.0	5.0	91.8	11.1	5.5
7	100.0	122.0	88.0	106.0	97.0	88.0	103.0	86.0	79.0	100.0	10.0	96.9	12.3	4.1	83.0	107.0	75.0	90.0	92.0	5.0	89.4	11.9	5.9
8	94.0	126.0	90.0	113.0	91.0	94.0	113.0	94.0	86.0	124.0	10.0	102.5	15.0	5.0	83.0	120.0	75.0	84.0	94.0	5.0	91.2	17.5	8.7
9	100.0	114.0	86.0	111.0	96.0	95.0	103.0	95.0	88.0	124.0	10.0	101.2	12.0	4.0	94.0	111.0	75.0	90.0	92.0	5.0	92.4	12.8	6.4
10	100.0	129.0	95.0	117.0	97.0	91.0	113.0	88.0	97.0	124.0	10.0	105.1	14.5	4.8	83.0	113.0	75.0	83.0	94.0	5.0	89.6	14.7	7.4
11	100.0	120.0	106.0	117.0	103.0	100.0	120.0	100.0	94.0	131.0	10.0	109.1	12.0	4.0	75.0	125.0	86.0	86.0	92.0	5.0	92.8	19.0	9.5
12	109.0	124.0	100.0	120.0	102.0	100.0	114.0	96.0	91.0	129.0	10.0	108.5	12.8	4.3	86.0	113.0	80.0	89.0	100.0	5.0	93.6	13.0	6.5

Single-leg press @ 80% 1 RM (Pre-training)
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	15.2	21.0	17.6	24.1	10.0	15.2	16.5	15.4	16.2	26.5	10.0	17.8	4.8	1.6	18.0	15.9	15.8	18.5	18.4	5.0	17.3	1.4	0.7
2	19.2	23.8	19.8	24.8	11.2	16.2	17.5	14.4	17.0	24.1	10.0	18.8	4.5	1.5	18.5	18.7	12.2	18.2	22.2	5.0	18.0	3.6	1.8
3	18.0	22.8	18.4	23.9	14.7	17.8	22.5	15.4	22.5	24.2	10.0	20.0	3.6	1.2	20.8	20.5	15.4	18.4	22.8	5.0	19.6	2.8	1.4
4	18.4	23.5	21.4	24.7	16.3	17.7	21.4	15.9	19.1	22.4	10.0	20.1	3.0	1.0	20.3	20.1	13.7	19.2	22.2	5.0	19.1	3.2	1.6
5	21.5	23.3	20.6	26.7	16.2	18.9	20.4	14.3	19.7	25.4	10.0	20.7	3.8	1.3	20.1	26.7	12.7	20.6	22.5	5.0	20.5	5.1	2.5
6	20.0	24.3	21.9	24.7	16.0	17.1	21.3	16.5	19.8	24.4	10.0	20.6	3.3	1.1	21.7	25.9	16.0	17.9	24.1	5.0	21.1	4.2	2.1
7	21.2	26.4	22.5	27.5	18.4	19.4	22.6	16.7	22.2	26.8	10.0	22.4	3.7	1.2	22.6	26.8	14.3	19.1	24.8	5.0	21.5	4.9	2.5
8	22.5	25.9	25.4	27.5	17.6	19.3	21.9	14.3	23.1	24.4	10.0	22.2	4.1	1.4	22.7	27.7	13.2	19.8	24.7	5.0	21.6	5.5	2.8
9	23.0	24.4	25.4	26.3	17.1	17.7	20.7	17.6	23.6	23.9	10.0	22.0	3.4	1.1	24.4	30.3	11.9	18.9	23.6	5.0	21.8	6.8	3.4
10	22.7	25.0	28.0	26.5	19.4	20.0	23.1	19.6	26.8	26.6	10.0	23.8	3.3	1.1	24.6	26.9	19.7	20.7	25.4	5.0	23.4	3.1	1.6
11	23.0	26.8	29.2	28.4	18.3	21.8	19.8	17.6	26.0	26.4	10.0	23.7	4.2	1.4	27.8	31.7	15.2	20.0	25.6	5.0	24.1	6.5	3.3
12	26.3	29.0	30.8	26.3	21.5	18.7	24.0	17.5	26.9	27.4	10.0	24.8	4.4	1.5	27.4	32.9	15.4	23.0	26.4	5.0	25.0	6.5	3.2

Single-leg press @ 80% of ORIGINAL 1 RM (Post-training)
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	15.9	23.2	20.7	22.7	17.5	16.0	18.2	17.4	13.7	18.4	10.0	18.4	3.0	1.0	16.0	23.1	12.5	14.6	16.4	5.0	16.5	4.0	2.0
2	17.3	20.8	17.3	20.0	16.3	15.6	18.5	19.3	13.2	20.7	10.0	17.9	2.4	0.8	15.4	22.0	14.6	16.2	20.3	5.0	17.7	3.3	1.6
3	15.8	21.0	16.9	22.8	18.7	16.0	19.1	16.2	15.3	17.6	10.0	17.9	2.5	0.8	17.0	23.4	11.0	15.7	21.8	5.0	17.8	4.9	2.5
4	15.5	20.7	17.8	20.2	19.8	17.0	19.0	18.7	18.3	20.4	10.0	18.7	1.7	0.6	18.3	26.6	14.4	17.3	21.6	5.0	19.6	4.7	2.3
5	15.2	21.5	15.9	20.8	19.7	16.7	19.6	19.1	16.1	23.0	10.0	18.8	2.7	0.9	17.0	30.5	13.0	17.8	19.0	5.0	19.4	6.6	3.3
6	17.0	22.1	17.3	23.6	20.4	15.6	19.5	18.6	18.1	22.6	10.0	19.5	2.6	0.9	18.4	31.3	16.2	20.1	23.4	5.0	21.9	5.9	2.9
7	16.3	23.4	16.7	22.0	20.9	18.2	22.9	20.0	17.9	21.4	10.0	20.0	2.6	0.9	18.3	31.8	14.6	19.7	22.2	5.0	21.3	6.5	3.2
8	17.5	23.8	17.8	21.5	19.3	15.7	20.5	19.2	19.9	22.8	10.0	19.8	2.5	0.8	19.0	32.5	14.6	18.8	22.7	5.0	21.5	6.8	3.4
9	16.3	24.6	18.7	23.9	21.0	17.8	21.7	19.6	21.0	22.2	10.0	20.7	2.6	0.9	21.4	31.4	14.9	19.4	22.3	5.0	21.9	6.0	3.0
10	17.2	25.1	18.9	22.6	21.1	16.7	23.4	18.5	22.8	22.1	10.0	20.8	2.8	0.9	19.8	33.6	15.0	18.1	23.0	5.0	21.9	7.2	3.6
11	18.2	24.6	22.1	25.9	21.5	17.9	23.7	20.2	21.2	22.2	10.0	21.8	2.6	0.9	18.0	32.5	17.7	19.4	23.0	5.0	22.1	6.2	3.1
12	17.8	26.8	19.6	23.2	20.7	16.7	20.5	20.8	22.3	26.7	10.0	21.5	3.4	1.1	20.5	36.4	16.2	19.9	25.0	5.0	23.6	7.8	3.9

TRAINxREP. INTERACTION - p <0.020

Single-leg press @ 80% of NEW 1 RM (Post-training)
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	17.8	24.0	16.7	19.8	10.4	17.3	19.2	15.6	14.4	22.8	10.0	17.8	4.0	1.3	16.0	21.6	12.6	14.6	16.4	5.0	16.3	3.3	1.7
2	18.6	22.7	18.0	19.0	14.4	17.1	16.8	15.7	17.6	21.4	10.0	18.1	2.5	0.8	15.4	22.6	14.6	16.3	20.2	5.0	17.8	3.5	1.7
3	18.1	23.1	16.3	21.7	17.0	17.8	18.6	19.5	18.2	18.6	10.0	18.9	2.1	0.7	17.0	27.3	11.0	15.7	21.8	5.0	18.6	6.2	3.1
4	17.9	25.7	16.2	20.2	16.2	17.2	16.8	18.0	18.6	21.4	10.0	18.8	3.0	1.0	18.3	26.6	14.4	17.4	21.5	5.0	19.6	4.6	2.3
5	18.0	24.7	16.8	21.8	18.0	19.5	19.4	17.8	19.7	27.3	10.0	20.3	3.3	1.1	17.0	28.4	13.1	17.7	19.0	5.0	19.0	5.7	2.8
6	20.2	25.1	18.7	23.4	18.0	18.7	20.1	19.0	21.4	26.9	10.0	21.2	3.0	1.0	18.4	29.5	16.1	20.1	23.4	5.0	21.5	5.2	2.6
7	19.6	27.0	18.7	23.5	18.8	19.8	21.3	18.2	20.9	22.5	10.0	21.0	2.7	0.9	18.3	29.4	14.6	19.7	22.1	5.0	20.8	5.5	2.8
8	19.4	28.9	20.8	26.0	18.2	21.2	24.1	20.9	22.9	28.5	10.0	23.1	3.7	1.2	18.9	33.6	14.6	18.8	22.7	5.0	21.7	7.2	3.6
9	20.6	26.4	20.0	26.8	19.1	21.9	21.6	21.0	23.9	29.5	10.0	23.1	3.4	1.1	21.4	31.5	14.9	19.4	22.3	5.0	21.9	6.1	3.0
10	20.7	29.9	23.7	28.3	21.3	21.1	24.0	20.2	28.3	30.4	10.0	24.8	4.0	1.3	19.8	32.8	15.0	18.0	23.0	5.0	21.7	6.8	3.4
11	20.7	27.6	26.1	28.4	24.1	24.0	26.4	23.4	29.1	32.1	10.0	26.2	3.3	1.1	18.0	37.0	17.7	19.4	22.9	5.0	23.0	8.1	4.0
12	23.2	28.8	24.2	30.6	24.6	23.7	25.4	22.3	25.7	32.3	10.0	26.1	3.3	1.1	20.6	32.8	16.2	19.9	25.0	5.0	22.9	6.4	3.2

Single–arm curl @ 70% 1 RM (Pre–training)
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	181.0	205.0	185.0	215.0	159.0	192.0	163.0	171.0	218.0	229.0	10.0	191.8	24.2	8.1	208.0	187.0	181.0	179.0	217.0	5.0	194.4	17.1	8.5
2	164.0	196.0	178.0	223.0	157.0	193.0	161.0	171.0	223.0	220.0	10.0	188.6	26.3	8.8	209.0	191.0	192.0	193.0	222.0	5.0	201.4	13.7	6.8
3	164.0	201.0	193.0	244.0	160.0	202.0	159.0	177.0	237.0	205.0	10.0	194.2	30.1	10.0	212.0	182.0	192.0	190.0	218.0	5.0	198.8	15.4	7.7
4	166.0	199.0	209.0	251.0	170.0	197.0	168.0	181.0	239.0	229.0	10.0	200.9	30.7	10.2	216.0	193.0	203.0	192.0	219.0	5.0	204.6	12.6	6.3
5	187.0	197.0	205.0	257.0	173.0	198.0	170.0	178.0	246.0	237.0	10.0	204.8	31.3	10.4	217.0	205.0	221.0	197.0	230.0	5.0	214.0	13.1	6.5
6	180.0	197.0	213.0	272.0	172.0	205.0	176.0	183.0	258.0	272.0	10.0	206.2	39.9	13.3	229.0	206.0	193.0	202.0	236.0	5.0	213.2	18.4	9.2
7	189.0	201.0	216.0	283.0	190.0	200.0	176.0	186.0	264.0	261.0	10.0	202.4	38.3	12.8	230.0	196.0	214.0	211.0	244.0	5.0	219.0	18.5	9.2
8	194.0	204.0	221.0	294.0	191.0	203.0	182.0	187.0	272.0	263.0	10.0	205.6	40.3	13.4	235.0	214.0	205.0	218.0	246.0	5.0	223.6	16.6	8.3
9	193.0	208.0	229.0	305.0	226.0	204.0	190.0	198.0	280.0	292.0	10.0	219.7	43.6	14.5	226.0	224.0	212.0	235.0	267.0	5.0	232.8	20.8	10.4
10	197.0	214.0	235.0	316.0	221.0	214.0	194.0	192.0	287.0	290.0	10.0	207.0	45.1	15.0	232.0	235.0	219.0	239.0	291.0	5.0	243.2	27.8	13.9

Single–arm curl @ 70% of ORIGINAL 1 RM (Post–training)
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	185.0	214.0	152.0	206.0	152.0	190.0	151.0	168.0	221.0		9.0	182.1	27.7	9.8	192.0	212.0	181.0	144.0	196.0	5.0	185.0	25.5	12.7
2	178.0	201.0	152.0	204.0	155.0	194.0	137.0	189.0	218.0		9.0	180.9	27.4	9.7	195.0	218.0	189.0	168.0	203.0	5.0	194.6	18.4	9.2
3	162.0	212.0	156.0	202.0	148.0	194.0	154.0	195.0	230.0		9.0	183.7	29.4	10.4	204.0	197.0	194.0	177.0	220.0	5.0	198.4	15.6	7.8
4	172.0	220.0	154.0	203.0	190.0	191.0	166.0	200.0	230.0		9.0	191.8	24.8	8.8	209.0	209.0	201.0	179.0	220.0	5.0	203.6	15.3	7.7
5	180.0	212.0	146.0	201.0	198.0	196.0	171.0	208.0	242.0		9.0	194.9	27.2	9.6	216.0	210.0	207.0	176.0	226.0	5.0	207.0	18.8	9.4
6	182.0	211.0	168.0	206.0	210.0	199.0	164.0	210.0	240.0		9.0	198.9	24.0	8.5	215.0	221.0	212.0	186.0	222.0	5.0	211.2	14.7	7.3
7	176.0	226.0	163.0	209.0	182.0	196.0	166.0	197.0	244.0		9.0	195.4	27.3	9.6	216.0	219.0	217.0	200.0	233.0	5.0	217.0	11.7	5.9
8	181.0	214.0	163.0	213.0	191.0	199.0	187.0	210.0	242.0		9.0	200.0	22.9	8.1	216.0	223.0	222.0	213.0	241.0	5.0	223.0	10.9	5.4
9	182.0	224.0	165.0	217.0	185.0	204.0	188.0	197.0	248.0		9.0	201.1	25.3	8.9	222.0	220.0	235.0	216.0	260.0	5.0	230.6	17.9	9.0
10	180.0	230.0	176.0	217.0	198.0	203.0	185.0	194.0	258.0		9.0	204.6	26.5	9.4	238.0	237.0	237.0	224.0	256.0	5.0	238.4	11.4	5.7

Single-arm curl @ 70% of NEW 1 RM (Post-training)
Peak Systolic BP (Torr)

WTTRAIN GROUP

REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
1	185.0	212.0	185.0	222.0	174.0	180.0	170.0	175.0	216.0		9.0	191.0	20.0	7.1
2	183.0	210.0	175.0	217.0	149.0	198.0	165.0	167.0	230.0		9.0	188.2	27.1	9.6
3	178.0	228.0	187.0	215.0	189.0	209.0	170.0	185.0	238.0		9.0	199.9	23.5	8.3
4	182.0	227.0	203.0	228.0	193.0	211.0	192.0	199.0	240.0		9.0	208.3	19.5	6.9
5	193.0	234.0	200.0	225.0	200.0	212.0	188.0	168.0	246.0		9.0	207.3	24.4	8.6
6	197.0	235.0	223.0	227.0	210.0	214.0	196.0	184.0	255.0		9.0	215.7	22.0	7.8
7	195.0	230.0	233.0	228.0	219.0	212.0	202.0	186.0	262.0		9.0	218.6	23.0	8.1
8	216.0	241.0	240.0	230.0	229.0	214.0	209.0	188.0	269.0		9.0	226.2	23.1	8.2
9	198.0	245.0	240.0	231.0	238.0	214.0	215.0	190.0	276.0		9.0	227.4	26.3	9.3
10	206.0	249.0	242.0	233.0	248.0	218.0	221.0	191.0	283.0		9.0	232.3	27.2	9.6

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
190.0	212.0	181.0	144.0	196.0	5.0	184.6	25.4	12.7
197.0	218.0	189.0	168.0	203.0	5.0	195.0	18.5	9.2
195.0	197.0	194.0	177.0	220.0	5.0	196.6	15.9	7.7
197.0	209.0	201.0	179.0	220.0	5.0	201.2	15.2	7.6
198.0	210.0	207.0	176.0	226.0	5.0	203.4	18.4	9.2
197.0	221.0	212.0	186.0	222.0	5.0	207.6	15.7	7.8
204.0	219.0	217.0	200.0	233.0	5.0	214.6	13.1	6.6
211.0	223.0	222.0	213.0	241.0	5.0	222.0	11.9	5.9
209.0	220.0	235.0	216.0	260.0	5.0	228.0	20.3	10.1
210.0	237.0	237.0	224.0	256.0	5.0	232.8	17.1	8.6

Single-arm curl @ 70% 1 RM (Pre-training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	115.0	119.0	118.0	123.0	93.0	94.0	94.0	98.0	110.0	131.0	10.0	109.5	13.8	4.6	123.0	96.0	115.0	110.0	119.0	5.0	112.6	10.5	5.2
2	103.0	107.0	114.0	136.0	93.0	98.0	94.0	93.0	111.0	114.0	10.0	106.3	13.4	4.5	123.0	108.0	124.0	110.0	121.0	5.0	117.2	7.6	3.8
3	102.0	111.0	128.0	162.0	93.0	99.0	94.0	99.0	123.0	123.0	10.0	113.4	21.3	7.1	124.0	100.0	128.0	109.0	115.0	5.0	115.2	11.3	5.7
4	118.0	111.0	148.0	172.0	100.0	99.0	100.0	101.0	123.0	141.0	10.0	121.3	25.0	8.3	127.0	108.0	134.0	110.0	120.0	5.0	119.8	11.1	5.5
5	127.0	106.0	133.0	165.0	105.0	99.0	99.0	103.0	130.0	152.0	10.0	121.9	23.4	7.8	127.0	109.0	140.0	111.0	130.0	5.0	123.4	13.2	6.6
6	122.0	106.0	148.0	188.0	107.0	103.0	100.0	108.0	141.0	164.0	10.0	128.7	30.2	10.1	127.0	116.0	134.0	113.0	132.0	5.0	124.4	9.4	4.7
7	121.0	111.0	160.0	200.0	117.0	104.0	100.0	109.0	144.0	154.0	10.0	132.0	31.9	10.6	130.0	98.0	124.0	117.0	129.0	5.0	119.6	13.1	6.6
8	126.0	114.0	164.0	212.0	113.0	101.0	102.0	108.0	150.0	159.0	10.0	134.9	35.8	11.9	127.0	114.0	130.0	122.0	132.0	5.0	125.0	7.2	3.6
9	129.0	114.0	171.0	224.0	146.0	103.0	113.0	119.0	156.0	182.0	10.0	145.7	38.1	12.7	127.0	108.0	133.0	126.0	146.0	5.0	128.0	13.7	6.9
10	132.0	117.0	178.0	236.0	136.0	111.0	111.0	111.0	162.0	182.0	10.0	147.6	41.4	13.8	130.0	133.0	135.0	135.0	174.0	5.0	141.4	18.3	9.2

Single-arm curl @ 70% of ORIGINAL 1 RM (Post-training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	100.0	111.0	86.0	125.0	95.0	94.0	80.0	125.0	110.0		9.0	102.9	16.0	5.7	104.0	120.0	113.0	82.0	98.0	5.0	103.4	14.6	7.3
2	103.0	104.0	86.0	123.0	96.0	94.0	77.0	107.0	107.0		9.0	99.7	13.4	4.7	103.0	117.0	117.0	94.0	104.0	5.0	107.0	9.9	5.0
3	89.0	118.0	86.0	117.0	94.0	95.0	84.0	106.0	113.0		9.0	100.2	13.5	4.8	111.0	107.0	128.0	99.0	111.0	5.0	111.2	10.6	5.3
4	98.0	117.0	78.0	118.0	104.0	96.0	95.0	108.0	111.0		9.0	102.8	12.6	4.5	113.0	115.0	125.0	99.0	121.0	5.0	114.6	9.9	5.0
5	100.0	113.0	85.0	115.0	114.0	96.0	94.0	102.0	115.0		9.0	103.8	11.0	3.9	118.0	120.0	131.0	99.0	125.0	5.0	118.6	12.1	6.0
6	99.0	119.0	98.0	118.0	90.0	96.0	90.0	128.0	116.0		9.0	106.0	14.2	5.0	113.0	138.0	131.0	104.0	123.0	5.0	121.8	13.6	6.8
7	98.0	128.0	91.0	118.0	96.0	97.0	95.0	111.0	116.0		9.0	105.6	13.0	4.6	113.0	121.0	135.0	108.0	131.0	5.0	121.6	11.5	5.7
8	100.0	119.0	91.0	121.0	104.0	97.0	102.0	112.0	114.0		9.0	106.7	10.3	3.6	115.0	120.0	130.0	116.0	127.0	5.0	121.6	6.7	3.3
9	100.0	129.0	98.0	125.0	102.0	100.0	102.0	102.0	120.0		9.0	108.7	12.3	4.3	120.0	110.0	151.0	117.0	153.0	5.0	130.2	20.2	10.1
10	100.0	131.0	98.0	128.0	108.0	100.0	99.0	96.0	127.0		9.0	109.7	14.7	5.2	115.0	142.0	147.0	121.0	149.0	5.0	134.8	15.7	7.8

Single–arm curl @ 70% of NEW 1 RM (Post–training)
Peak Diastolic BP (Torr)

WTTRAIN GROUP

REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
1	106.0	125.0	109.0	141.0	114.0	95.0	96.0	90.0	112.0		9.0	109.8	16.0	5.7
2	104.0	115.0	115.0	140.0	100.0	103.0	96.0	91.0	115.0		9.0	108.8	14.6	5.2
3	101.0	120.0	120.0	123.0	124.0	108.0	100.0	108.0	118.0		9.0	113.6	9.4	3.3
4	105.0	126.0	126.0	145.0	134.0	114.0	108.0	125.0	125.0		9.0	123.1	12.6	4.4
5	111.0	130.0	139.0	136.0	120.0	112.0	112.0	95.0	127.0		9.0	120.2	14.1	5.0
6	115.0	135.0	139.0	135.0	132.0	112.0	116.0	115.0	131.0		9.0	125.6	10.8	3.8
7	110.0	130.0	145.0	135.0	137.0	116.0	120.0	119.0	135.0		9.0	127.4	11.6	4.1
8	125.0	135.0	153.0	134.0	141.0	120.0	124.0	124.0	139.0		9.0	132.8	10.6	3.7
9	113.0	137.0	160.0	134.0	146.0	120.0	129.0	128.0	143.0		9.0	134.4	14.2	5.0
10	123.0	140.0	167.0	133.0	151.0	122.0	133.0	133.0	147.0		9.0	138.8	14.3	5.1

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
102.0	120.0	113.0	82.0	98.0	5.0	103.0	14.6	7.3
105.0	117.0	117.0	94.0	104.0	5.0	107.4	9.8	4.9
104.0	107.0	128.0	99.0	111.0	5.0	109.8	11.1	5.5
105.0	115.0	125.0	99.0	121.0	5.0	113.0	10.9	5.4
105.0	120.0	131.0	99.0	125.0	5.0	116.0	13.5	6.8
108.0	138.0	131.0	104.0	123.0	5.0	120.8	14.6	7.3
108.0	121.0	135.0	108.0	131.0	5.0	120.6	12.6	6.3
110.0	120.0	130.0	116.0	127.0	5.0	120.6	8.1	4.1
110.0	110.0	151.0	117.0	153.0	5.0	128.2	21.9	11.0
114.0	142.0	147.0	121.0	149.0	5.0	134.6	16.0	8.0

Single-arm curl @ 70% 1 RM (Pre-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
126.0	136.0	140.0	169.0	129.0	136.0	124.0	126.0	168.0	151.0	10.0	140.5	16.8	5.6

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
158.0	136.0	143.0	147.0	156.0	5.0	148.0	9.1	4.6

Single-arm curl @ 70% of ORIGINAL 1 RM (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
123.0	144.0	102.0	148.0	125.0	132.0	124.0	126.0	150.0		9.0	130.4	15.1	5.4

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
155.0	147.0	141.0	126.0	143.0	5.0	142.4	10.6	5.3

Single-arm curl @ 70% of NEW 1 RM (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
136.0	150.0	135.0	156.0	137.0	141.0	138.0	120.0	174.0		9.0	143.0	15.4	5.4

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
143.0	147.0	141.0	126.0	143.0	5.0	140.0	8.1	4.1

Single-arm curl @ 70% 1 RM (Pre-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	90.0	113.0	78.0	111.0	75.0	75.0	88.0	67.0	60.0	124.0	10.0	88.1	21.4	7.1	83.0	88.0	63.0	75.0	89.0	5.0	79.6	10.8	5.4
2	90.0	117.0	88.0	104.0	83.0	80.0	94.0	83.0	71.0	120.0	10.0	93.0	16.0	5.3	88.0	94.0	71.0	88.0	100.0	5.0	88.2	10.8	5.4
3	90.0	111.0	95.0	120.0	83.0	64.0	97.0	79.0	68.0	124.0	10.0	93.1	20.6	6.9	88.0	106.0	79.0	80.0	88.0	5.0	88.2	10.8	5.4
4	90.0	120.0	86.0	117.0	86.0	80.0	95.0	77.0	71.0	131.0	10.0	95.3	20.3	6.8	88.0	100.0	75.0	88.0	100.0	5.0	90.2	10.4	5.2
5	92.0	117.0	90.0	115.0	90.0	83.0	103.0	75.0	78.0	133.0	10.0	97.6	18.9	6.3	95.0	94.0	88.0	90.0	100.0	5.0	93.4	4.7	2.3
6	92.0	117.0	97.0	120.0	79.0	80.0	92.0	75.0	75.0	137.0	10.0	96.4	21.5	7.2	94.0	95.0	82.0	75.0	100.0	5.0	89.2	10.3	5.2
7	95.0	120.0	97.0	122.0	100.0	71.0	91.0	78.0	80.0	138.0	10.0	99.2	21.5	7.2	88.0	100.0	91.0	95.0	100.0	5.0	94.8	5.4	2.7
8	100.0	126.0	104.0	124.0	90.0	80.0	100.0	79.0	83.0	136.0	10.0	102.2	20.4	6.8	95.0	100.0	91.0	88.0	100.0	5.0	94.8	5.4	2.7
9	98.0	120.0	105.0	126.0	93.0	94.0	104.0	82.0	86.0	131.0	10.0	103.9	16.8	5.6	95.0	100.0	92.0	88.0	100.0	5.0	95.0	5.2	2.6
10	99.0	124.0	108.0	128.0	106.0	60.0	90.0	79.0	89.0	140.0	10.0	102.3	24.2	8.1	88.0	100.0	91.0	94.0	100.0	5.0	94.6	5.4	2.7

Single-arm curl @ 70% of ORIGINAL 1 RM (Post-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	88.0	114.0	94.0	90.0	92.0	60.0	82.0	86.0	60.0		9.0	85.1	16.8	5.9	60.0	100.0	82.0	79.0	80.0	5.0	80.2	14.2	7.1
2	100.0	113.0	75.0	100.0	100.0	75.0	90.0	86.0	60.0		9.0	88.8	16.5	5.8	75.0	86.0	75.0	75.0	91.0	5.0	80.4	7.6	3.8
3	95.0	114.0	77.0	94.0	100.0	75.0	95.0	88.0	63.0		9.0	89.0	15.2	5.4	75.0	95.0	86.0	79.0	88.0	5.0	84.6	7.8	3.9
4	100.0	113.0	94.0	105.0	100.0	64.0	106.0	80.0	67.0		9.0	92.1	17.6	6.2	71.0	100.0	78.0	88.0	83.0	5.0	84.0	10.9	5.5
5	83.0	120.0	86.0	94.0	92.0	80.0	106.0	86.0	65.0		9.0	90.2	15.7	5.6	75.0	106.0	91.0	79.0	95.0	5.0	89.2	12.5	6.2
6	95.0	115.0	83.0	111.0	82.0	64.0	100.0	80.0	60.0		9.0	87.8	19.2	6.8	71.0	106.0	84.0	86.0	94.0	5.0	88.2	12.9	6.5
7	83.0	115.0	83.0	100.0	86.0	80.0	106.0	86.0	63.0		9.0	89.1	15.5	5.5	83.0	111.0	88.0	86.0	94.0	5.0	92.4	11.1	5.6
8	88.0	118.0	77.0	105.0	92.0	75.0	106.0	90.0	67.0		9.0	90.9	16.5	5.8	75.0	105.0	81.0	91.0	100.0	5.0	90.4	12.6	6.3
9	100.0	120.0	91.0	113.0	100.0	79.0	100.0	83.0	71.0		9.0	95.2	15.9	5.6	75.0	100.0	95.0	91.0	103.0	5.0	92.8	11.0	5.5
10	80.0	117.0	79.0	106.0	92.0	60.0	113.0	80.0	75.0		9.0	89.1	19.2	6.8	75.0	113.0	91.0	93.0	104.0	5.0	95.2	14.4	7.2

Single–arm curl @ 70% of NEW 1 RM (Post–training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	100.0	117.0	83.0	100.0	95.0	67.0	100.0	77.0	60.0		9.0	88.8	18.3	6.5	64.0	100.0	82.0	79.0	80.0	5.0	81.0	12.8	6.4
2	88.0	125.0	95.0	95.0	97.0	80.0	106.0	75.0	75.0		9.0	92.9	16.0	5.7	69.0	86.0	75.0	75.0	91.0	5.0	79.2	9.0	4.5
3	100.0	125.0	95.0	111.0	97.0	80.0	107.0	79.0	71.0		9.0	96.1	17.2	6.1	80.0	95.0	86.0	79.0	88.0	5.0	85.6	6.5	3.3
4	91.0	126.0	100.0	109.0	97.0	94.0	102.0	75.0	77.0		9.0	96.8	15.6	5.5	64.0	100.0	78.0	88.0	83.0	5.0	82.6	13.2	6.6
5	100.0	127.0	100.0	111.0	98.0	80.0	104.0	76.0	73.0		9.0	96.6	17.6	6.2	64.0	106.0	91.0	79.0	95.0	5.0	87.0	16.1	8.0
6	100.0	127.0	104.0	115.0	99.0	80.0	105.0	76.0	77.0		9.0	98.1	17.6	6.2	60.0	106.0	84.0	86.0	94.0	5.0	86.0	16.9	8.5
7	95.0	126.0	109.0	117.0	99.0	91.0	105.0	79.0	83.0		9.0	100.4	15.4	5.5	80.0	111.0	88.0	86.0	94.0	5.0	91.8	11.8	5.9
8	100.0	125.0	109.0	121.0	100.0	88.0	106.0	80.0	87.0		9.0	101.8	15.3	5.4	64.0	105.0	81.0	91.0	100.0	5.0	88.2	16.3	8.2
9	100.0	124.0	113.0	124.0	100.0	83.0	106.0	83.0	89.0		9.0	102.4	15.8	5.6	75.0	100.0	95.0	91.0	103.0	5.0	92.8	11.0	5.5
10	113.0	125.0	113.0	128.0	101.0	90.0	107.0	78.0	90.0		9.0	105.0	16.8	5.9	69.0	113.0	91.0	93.0	104.0	5.0	94.0	16.6	8.3

Single-arm curl @ 70% 1 RM (Pre-training)
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	16.3	23.1	14.4	23.8	11.9	14.4	14.4	11.4	13.1	28.3	10.0	17.1	5.8	1.9	17.3	16.5	11.4	13.4	19.3	5.0	15.6	3.1	1.6
2	14.8	22.9	15.6	23.3	13.1	15.4	15.1	14.3	15.9	26.4	10.0	17.7	4.7	1.6	18.4	17.9	13.7	17.0	22.2	5.0	17.9	3.0	1.5
3	14.8	22.2	18.3	29.2	13.3	13.0	15.5	14.0	16.2	25.3	10.0	18.2	5.6	1.9	18.7	19.3	15.2	15.2	19.2	5.0	17.5	2.1	1.1
4	14.9	23.9	17.9	29.5	14.6	15.8	15.9	14.0	17.1	30.1	10.0	19.4	6.2	2.1	19.1	19.3	15.2	16.9	21.9	5.0	18.5	2.5	1.3
5	17.3	23.1	18.5	29.5	15.6	16.5	17.5	13.4	19.1	31.6	10.0	20.2	6.0	2.0	20.6	19.2	19.3	17.7	23.0	5.0	20.0	2.0	1.0
6	16.6	23.0	20.6	32.3	13.6	16.4	16.3	13.7	19.4	37.3	10.0	20.9	8.0	2.7	21.5	19.5	15.8	15.2	23.6	5.0	19.1	3.6	1.8
7	18.0	24.1	20.9	34.1	19.0	14.1	16.0	14.6	21.0	35.9	10.0	21.8	7.6	2.5	20.3	19.6	19.5	20.0	24.4	5.0	20.8	2.1	1.0
8	19.4	25.8	23.0	35.9	17.2	16.2	18.0	14.8	22.2	35.9	10.0	22.8	7.6	2.5	22.3	21.4	18.7	19.2	24.6	5.0	21.2	2.4	1.2
9	19.1	25.0	23.7	37.6	21.0	19.1	19.8	16.2	23.4	38.3	10.0	24.3	7.6	2.5	21.4	22.4	19.6	20.6	26.7	5.0	22.1	2.8	1.4
10	19.7	26.4	24.8	39.4	23.4	12.8	17.5	15.2	24.6	40.1	10.0	24.4	9.2	3.1	20.4	23.5	20.0	22.5	29.1	5.0	23.1	3.7	1.8

Single-arm curl @ 70% of ORIGINAL 1 RM (Post-training)
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	16.3	24.4	14.3	18.5	14.0	11.4	12.4	13.9	13.3		9.0	15.4	4.0	1.4	11.5	21.2	14.8	11.4	15.7	5.0	14.9	4.0	2.0
2	17.8	22.6	11.4	20.4	15.5	14.6	12.3	16.2	13.1		9.0	16.0	3.7	1.3	14.6	18.7	14.2	12.6	18.5	5.0	15.7	2.7	1.4
3	15.4	24.2	12.0	18.9	14.8	14.6	14.6	17.2	14.5		9.0	16.2	3.5	1.3	15.3	18.7	16.6	14.0	19.4	5.0	16.8	2.3	1.1
4	17.2	24.8	14.4	21.3	19.0	12.3	17.6	16.0	15.3		9.0	17.5	3.8	1.3	14.8	20.9	15.7	15.8	18.3	5.0	17.1	2.5	1.3
5	15.0	25.4	12.5	18.8	18.3	15.7	18.1	17.8	15.8		9.0	17.5	3.6	1.3	16.2	22.2	18.9	13.9	21.6	5.0	18.6	3.5	1.8
6	17.2	24.4	14.0	22.8	17.2	12.8	16.4	16.8	14.4		9.0	17.3	3.9	1.4	15.2	23.4	17.8	15.9	20.8	5.0	18.6	3.4	1.7
7	14.7	26.0	13.5	20.9	15.6	15.7	17.6	16.9	15.4		9.0	17.4	3.9	1.4	18.0	24.2	19.0	17.1	21.8	5.0	20.0	2.9	1.5
8	16.0	25.0	12.6	22.4	17.6	14.9	19.8	18.9	16.1		9.0	18.1	3.9	1.4	16.2	23.4	18.0	19.5	24.1	5.0	20.2	3.4	1.7
9	18.2	26.9	15.0	24.4	18.5	16.1	18.8	16.4	17.5		9.0	19.1	4.0	1.4	16.7	22.0	21.1	19.6	26.7	5.0	21.2	3.7	1.8
10	14.4	27.0	13.9	23.0	18.3	12.2	20.8	15.5	19.4		9.0	18.3	4.8	1.7	17.9	26.7	20.9	20.6	26.7	5.0	22.5	4.0	2.0

Single–arm curl @ 70% of NEW 1 RM (Post–training)
Rate–Pressure Product

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	18.5	24.8	15.4	22.2	16.5	12.1	17.0	13.5	13.0		9.0	17.0	4.3	1.5	12.2	21.2	14.8	11.4	15.7	5.0	15.1	3.9	1.9
2	16.1	26.3	16.6	20.6	14.5	15.8	17.5	12.5	17.3		9.0	17.5	4.0	1.4	13.6	18.7	14.2	12.6	18.5	5.0	15.5	2.9	1.4
3	17.8	28.5	17.8	23.9	18.3	16.7	18.2	14.6	16.9		9.0	19.2	4.3	1.5	15.6	18.7	16.7	14.0	19.4	5.0	16.9	2.2	1.1
4	16.6	28.6	20.3	24.9	18.7	19.8	19.6	14.9	18.5		9.0	20.2	4.2	1.5	12.6	20.9	15.7	15.8	18.3	5.0	16.6	3.1	1.6
5	19.3	29.7	20.0	25.0	19.6	17.0	19.6	12.8	18.0		9.0	20.1	4.8	1.7	12.7	22.3	18.8	13.9	21.5	5.0	17.8	4.4	2.2
6	19.7	29.8	23.2	26.1	20.8	17.1	20.6	14.0	19.6		9.0	21.2	4.7	1.7	11.8	23.4	17.8	16.0	20.9	5.0	18.0	4.5	2.2
7	18.5	29.0	25.4	26.7	21.7	19.3	21.2	14.7	21.7		9.0	22.0	4.4	1.6	16.3	24.3	19.1	17.2	21.9	5.0	19.8	3.3	1.7
8	21.6	30.1	26.2	27.8	22.9	18.8	22.2	15.0	23.4		9.0	23.1	4.6	1.6	13.5	23.4	18.0	19.4	24.1	5.0	19.7	4.3	2.2
9	19.8	30.4	27.1	28.6	23.8	17.8	22.8	15.8	24.6		9.0	23.4	4.9	1.7	15.7	22.0	22.3	19.7	26.8	5.0	21.3	4.1	2.0
10	23.3	31.1	27.3	29.8	25.0	19.6	23.6	14.9	25.5		9.0	24.5	5.0	1.8	14.5	26.8	21.6	20.8	26.6	5.0	22.1	5.1	2.5

Single-arm military press @ 70% 1 RM (Pre-training)
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	212.0	218.0	214.0	215.0	170.0	215.0	171.0	185.0	240.0	205.0	10.0	204.5	22.4	7.5	208.0	214.0	194.0	215.0	236.0	5.0	213.4	15.2	7.6
2	200.0	216.0	217.0	233.0	173.0	226.0	176.0	186.0	253.0	200.0	10.0	208.0	25.8	8.8	219.0	230.0	192.0	228.0	244.0	5.0	222.6	19.3	9.7
3	218.0	207.0	226.0	226.0	161.0	233.0	169.0	187.0	254.0	200.0	10.0	208.1	29.3	9.8	221.0	214.0	183.0	236.0	268.0	5.0	224.4	31.1	15.6
4	214.0	221.0	221.0	239.0	172.0	244.0	165.0	199.0	259.0	220.0	10.0	215.4	29.9	10.0	225.0	235.0	195.0	223.0	254.0	5.0	226.4	21.4	10.7
5	223.0	221.0	230.0	258.0	170.0	246.0	174.0	207.0	263.0	231.0	10.0	222.3	31.5	10.5	230.0	245.0	200.0	245.0	262.0	5.0	236.4	23.3	11.6
6	213.0	229.0	239.0	246.0	179.0	253.0	183.0	218.0	272.0	224.0	10.0	225.6	29.3	9.8	232.0	258.0	201.0	248.0	257.0	5.0	239.2	23.8	11.9
7	237.0	244.0	246.0	263.0	205.0	257.0	191.0	221.0	285.0	240.0	10.0	238.9	27.6	9.2	243.0	259.0	205.0	267.0	316.0	5.0	258.0	40.2	20.1
8	233.0	253.0	248.0	255.0	205.0	267.0	196.0	214.0	291.0	278.0	10.0	244.0	31.5	10.5	249.0	255.0	215.0	275.0	282.0	5.0	255.2	26.3	13.1
9	247.0	264.0	242.0	257.0	217.0	273.0	221.0	221.0	299.0	285.0	10.0	252.6	28.2	9.4	257.0	270.0	233.0	261.0	288.0	5.0	261.8	20.0	10.0
10	244.0	272.0	251.0	277.0	228.0	280.0	210.0	229.0	304.0	295.0	10.0	259.0	31.3	10.4	255.0	265.0	238.0	281.0	323.0	5.0	272.4	32.3	16.2

Single-arm military press @ 70% of ORIGINAL 1 RM (Post-training)
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	197.0	207.0	182.0	209.0	189.0	218.0	201.0	174.0	263.0		9.0	204.4	25.9	9.2	210.0	228.0	200.0	218.0	227.0	5.0	216.6	11.8	5.9
2	187.0	212.0	191.0	221.0	168.0	227.0	181.0	180.0	256.0		9.0	202.6	28.3	10.0	212.0	239.0	201.0	233.0	254.0	5.0	227.8	21.3	10.6
3	196.0	210.0	185.0	207.0	178.0	237.0	191.0	197.0	267.0		9.0	207.6	28.1	9.9	224.0	240.0	213.0	226.0	245.0	5.0	229.6	12.9	6.4
4	214.0	222.0	185.0	217.0	180.0	248.0	174.0	196.0	276.0		9.0	212.4	33.5	11.8	221.0	260.0	211.0	249.0	267.0	5.0	241.6	24.5	12.2
5	218.0	217.0	201.0	223.0	191.0	261.0	178.0	210.0	283.0		9.0	220.2	33.0	11.7	240.0	265.0	215.0	274.0	292.0	5.0	257.2	30.1	15.1
6	207.0	230.0	213.0	228.0	197.0	266.0	203.0	212.0	292.0		9.0	227.6	31.7	11.2	239.0	270.0	216.0	274.0	295.0	5.0	258.8	31.2	15.6
7	238.0	239.0	192.0	245.0	197.0	270.0	190.0	198.0	304.0		9.0	230.3	39.7	14.0	238.0	282.0	221.0	275.0	311.0	5.0	265.4	35.9	18.0
8	223.0	240.0	208.0	240.0	200.0	275.0	211.0	216.0	286.0		9.0	233.2	30.1	10.6	240.0	272.0	225.0	295.0	316.0	5.0	269.6	37.6	18.8
9	248.0	250.0	205.0	236.0	197.0	281.0	212.0	220.0	290.0		9.0	237.7	32.7	11.6	242.0	289.0	232.0	313.0	334.0	5.0	282.0	44.2	22.1
10	258.0	258.0	215.0	246.0	218.0	283.0	226.0	217.0	323.0		9.0	249.3	36.2	12.8	264.0	300.0	243.0	310.0	347.0	5.0	292.8	40.6	20.3

Single-arm military press @ 70% of NEW 1 RM (Post-training) Peak Systolic BP (Torr)

WTTRAIN GROUP

REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
1	200.0	238.0	200.0	210.0	148.0	210.0	193.0	182.0	216.0		9.0	199.7	24.9	8.8
2	210.0	200.0	208.0	204.0	142.0	211.0	165.0	172.0	234.0		9.0	194.0	28.5	10.1
3	197.0	222.0	208.0	200.0	158.0	206.0	167.0	198.0	270.0		9.0	202.9	32.2	11.4
4	215.0	228.0	202.0	210.0	196.0	222.0	167.0	192.0	282.0		9.0	212.7	31.7	11.2
5	238.0	234.0	213.0	228.0	192.0	245.0	180.0	210.0	284.0		9.0	224.9	30.9	10.9
6	236.0	250.0	233.0	247.0	173.0	249.0	195.0	214.0	290.0		9.0	231.9	34.3	12.1
7	245.0	265.0	228.0	265.0	186.0	253.0	198.0	221.0	289.0		9.0	238.9	33.6	11.9
8	253.0	261.0	232.0	253.0	216.0	270.0	198.0	229.0	299.0		9.0	245.7	30.4	10.8
9	261.0	268.0	243.0	255.0	240.0	280.0	222.0	236.0	318.0		9.0	258.1	28.6	10.1
10	269.0	275.0	255.0	287.0	230.0	282.0	215.0	244.0	329.0		9.0	265.1	34.0	12.0

Single-arm military press @ 70% 1 RM (Pre-training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP															CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	125.0	123.0	116.0	124.0	103.0	111.0	107.0	103.0	124.0	123.0	10.0	115.9	9.1	3.0	129.0	119.0	123.0	123.0	131.0	5.0	125.0	4.9	2.4
2	101.0	122.0	117.0	134.0	107.0	118.0	101.0	100.0	129.0	118.0	10.0	114.7	12.1	4.0	129.0	129.0	117.0	129.0	141.0	5.0	129.0	8.5	4.2
3	125.0	112.0	123.0	140.0	101.0	129.0	103.0	106.0	131.0	117.0	10.0	118.7	13.1	4.4	134.0	123.0	105.0	129.0	127.0	5.0	123.6	11.1	5.6
4	120.0	123.0	129.0	147.0	110.0	136.0	100.0	107.0	129.0	140.0	10.0	124.1	15.1	5.0	137.0	124.0	123.0	129.0	163.0	5.0	135.2	16.5	8.2
5	121.0	131.0	131.0	147.0	116.0	141.0	110.0	113.0	134.0	130.0	10.0	127.4	12.1	4.0	142.0	135.0	121.0	140.0	138.0	5.0	135.2	8.3	4.2
6	119.0	128.0	127.0	148.0	104.0	144.0	113.0	120.0	140.0	135.0	10.0	127.8	14.1	4.7	149.0	140.0	121.0	137.0	147.0	5.0	138.8	11.1	5.5
7	135.0	141.0	145.0	160.0	127.0	148.0	111.0	121.0	149.0	133.0	10.0	137.0	14.6	4.8	149.0	123.0	138.0	154.0	179.0	5.0	148.6	20.7	10.4
8	138.0	154.0	141.0	154.0	125.0	157.0	111.0	121.0	151.0	162.0	10.0	141.4	17.3	5.8	157.0	149.0	135.0	147.0	148.0	5.0	147.2	7.9	3.9
9	149.0	160.0	145.0	163.0	135.0	164.0	133.0	123.0	159.0	144.0	10.0	147.5	14.1	4.7	160.0	149.0	144.0	146.0	148.0	5.0	149.4	6.2	3.1
10	139.0	161.0	154.0	173.0	141.0	170.0	131.0	128.0	161.0	169.0	10.0	152.7	16.7	5.8	159.0	155.0	149.0	155.0	196.0	5.0	162.8	18.9	9.4

Single-arm military press @ 70% of ORIGINAL 1 RM (Post-training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP															CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	117.0	121.0	111.0	124.0	108.0	100.0	122.0	85.0	131.0		9.0	113.2	14.1	5.0	113.0	154.0	111.0	114.0	115.0	5.0	121.4	18.3	9.1
2	110.0	121.0	111.0	127.0	96.0	108.0	107.0	101.0	119.0		9.0	111.1	9.8	3.5	114.0	156.0	111.0	119.0	140.0	5.0	128.0	19.3	9.7
3	116.0	120.0	114.0	125.0	104.0	123.0	107.0	110.0	125.0		9.0	116.0	7.8	2.8	119.0	165.0	119.0	120.0	149.0	5.0	134.4	21.4	10.7
4	131.0	131.0	117.0	129.0	105.0	123.0	110.0	108.0	139.0		9.0	121.4	12.0	4.2	131.0	171.0	114.0	133.0	150.0	5.0	139.8	21.6	10.8
5	134.0	126.0	125.0	140.0	111.0	137.0	112.0	116.0	146.0		9.0	127.4	12.7	4.5	140.0	188.0	120.0	143.0	169.0	5.0	152.0	26.6	13.3
6	131.0	135.0	130.0	142.0	116.0	137.0	120.0	122.0	150.0		9.0	131.4	11.0	3.9	129.0	188.0	119.0	146.0	170.0	5.0	150.4	28.6	14.3
7	147.0	141.0	119.0	150.0	116.0	139.0	120.0	107.0	136.0		9.0	130.6	15.3	5.4	137.0	180.0	125.0	149.0	177.0	5.0	153.6	24.3	12.1
8	136.0	141.0	130.0	139.0	114.0	141.0	122.0	121.0	141.0		9.0	131.7	10.3	3.7	147.0	185.0	126.0	157.0	152.0	5.0	153.4	21.2	10.6
9	150.0	153.0	130.0	148.0	120.0	147.0	130.0	122.0	146.0		9.0	138.4	12.8	4.5	141.0	193.0	139.0	163.0	181.0	5.0	163.4	23.9	11.9
10	156.0	154.0	140.0	152.0	128.0	151.0	133.0	116.0	163.0		9.0	143.7	15.4	5.4	153.0	198.0	147.0	161.0	187.0	5.0	169.2	22.2	11.1

TRAINxREP. INTERACTION - $p < 0.002$; MAIN EFFECT GROUP - $p < 0.047$

Single-arm military press @ 70% of NEW 1 RM (Post-training)
Peak Diastolic BP (Torr)

WTTRAIN GROUP

REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
1	128.0	144.0	114.0	138.0	88.0	125.0	113.0	102.0	125.0		9.0	119.7	17.5	6.2
2	130.0	125.0	111.0	141.0	98.0	120.0	105.0	108.0	125.0		9.0	118.1	13.7	4.8
3	129.0	120.0	122.0	122.0	107.0	125.0	112.0	115.0	132.0		9.0	120.4	8.0	2.8
4	136.0	122.0	122.0	129.0	133.0	122.0	112.0	110.0	127.0		9.0	123.7	8.7	3.1
5	138.0	130.0	128.0	130.0	130.0	146.0	112.0	125.0	131.0		9.0	130.0	9.2	3.2
6	140.0	150.0	135.0	130.0	114.0	152.0	114.0	126.0	148.0		9.0	134.3	14.5	5.1
7	142.0	157.0	145.0	146.0	134.0	150.0	116.0	131.0	158.0		9.0	142.1	13.4	4.7
8	145.0	149.0	138.0	154.0	140.0	150.0	117.0	136.0	156.0		9.0	142.8	11.9	4.2
9	147.0	153.0	144.0	148.0	145.0	170.0	132.0	141.0	161.0		9.0	149.0	11.2	4.0
10	150.0	156.0	157.0	177.0	148.0	170.0	132.0	146.0	167.0		9.0	155.9	13.9	4.9

Single-arm military press @ 70% 1 RM (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
146.0	159.0	158.0	177.0	134.0	155.0	124.0	138.0	190.0	148.0

N	MEAN	S.D.	SEM
10.0	152.9	19.8	6.6

CONTROL GROUP

A	B	C	D	E
169.0	162.0	145.0	166.0	176.0

N	MEAN	S.D.	SEM
5.0	163.6	11.6	5.8

Single-arm military press @ 70% of ORIGINAL 1 RM (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
141.0	157.0	128.0	156.0	133.0	159.0	132.0	129.0	184.0	

N	MEAN	S.D.	SEM
9.0	146.6	18.8	6.7

CONTROL GROUP

A	B	C	D	E
175.0	197.0	141.0	166.0	169.0

N	MEAN	S.D.	SEM
5.0	169.6	20.1	10.0

Single-arm military press @ 70% of NEW 1 RM (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
144.0	168.0	137.0	164.0	131.0	156.0	132.0	130.0	188.0	

N	MEAN	S.D.	SEM
9.0	150.0	20.3	7.2

CONTROL GROUP

A	B	C	D	E
-	-	-	-	-

N	MEAN	S.D.	SEM
-	-	-	-

Single-arm military press @ 70% 1 RM (Pre-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	95.0	117.0	88.0	100.0	77.0	100.0	94.0	71.0	65.0	124.0	10.0	93.1	18.8	6.3	80.0	106.0	71.0	83.0	86.0	5.0	85.2	12.9	6.5
2	97.0	106.0	94.0	105.0	60.0	107.0	94.0	86.0	78.0	124.0	10.0	95.1	17.7	5.8	88.0	106.0	75.0	88.0	100.0	5.0	91.4	12.0	6.0
3	108.0	120.0	88.0	112.0	83.0	106.0	94.0	93.0	75.0	133.0	10.0	101.2	17.8	5.9	86.0	114.0	73.0	83.0	92.0	5.0	89.6	15.3	7.6
4	95.0	111.0	103.0	100.0	80.0	105.0	100.0	79.0	77.0	124.0	10.0	97.4	15.1	5.0	94.0	113.0	77.0	95.0	92.0	5.0	94.2	12.8	6.4
5	111.0	117.0	106.0	107.0	88.0	117.0	107.0	95.0	82.0	145.0	10.0	107.5	17.6	5.9	88.0	111.0	86.0	90.0	107.0	5.0	96.4	11.7	5.8
6	106.0	114.0	95.0	117.0	86.0	120.0	100.0	86.0	86.0	140.0	10.0	105.0	17.9	6.0	88.0	125.0	79.0	90.0	100.0	5.0	96.4	17.6	8.8
7	103.0	123.0	106.0	123.0	94.0	106.0	113.0	95.0	88.0	145.0	10.0	109.6	17.1	5.7	94.0	113.0	90.0	96.0	107.0	5.0	100.0	9.6	4.8
8	114.0	124.0	100.0	123.0	90.0	117.0	106.0	90.0	90.0	141.0	10.0	109.5	17.3	5.8	90.0	117.0	100.0	100.0	106.0	5.0	102.6	9.9	4.9
9	111.0	126.0	108.0	123.0	91.0	119.0	106.0	91.0	91.0	150.0	10.0	111.6	18.8	6.3	100.0	111.0	88.0	91.0	100.0	5.0	98.0	9.0	4.5
10	109.0	129.0	113.0	130.0	95.0	120.0	115.0	95.0	98.0	150.0	10.0	115.4	17.8	5.9	94.0	133.0	100.0	100.0	117.0	5.0	108.8	16.0	8.0

Single-arm military press @ 70% of ORIGINAL 1 RM (Post-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP								
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	92.0	117.0	75.0	100.0	100.0	100.0	107.0	80.0	86.0		9.0	95.2	13.8	4.7	75.0	94.0	79.0	100.0	90.0	5.0	87.6	10.4	5.2
2	95.0	117.0	83.0	95.0	100.0	106.0	107.0	83.0	75.0		9.0	95.7	13.5	4.8	75.0	100.0	79.0	88.0	100.0	5.0	88.4	11.6	5.8
3	95.0	114.0	83.0	105.0	115.0	107.0	100.0	90.0	86.0		9.0	99.4	11.7	4.1	75.0	100.0	79.0	100.0	100.0	5.0	90.8	12.7	6.3
4	95.0	125.0	94.0	113.0	109.0	107.0	125.0	83.0	88.0		9.0	104.3	15.3	5.4	80.0	113.0	71.0	106.0	105.0	5.0	95.0	18.3	9.2
5	98.0	120.0	90.0	111.0	100.0	106.0	120.0	100.0	83.0		9.0	103.1	12.6	4.4	80.0	120.0	88.0	100.0	105.0	5.0	98.6	15.5	7.7
6	105.0	122.0	88.0	106.0	117.0	113.0	117.0	88.0	95.0		9.0	105.7	12.8	4.5	80.0	124.0	73.0	100.0	108.0	5.0	97.0	20.8	10.4
7	100.0	125.0	100.0	114.0	120.0	117.0	115.0	93.0	88.0		9.0	108.0	13.0	4.6	88.0	111.0	90.0	109.0	111.0	5.0	101.8	11.7	5.9
8	100.0	120.0	94.0	111.0	109.0	120.0	129.0	95.0	94.0		9.0	108.0	13.1	4.6	80.0	124.0	88.0	104.0	113.0	5.0	101.8	17.9	9.0
9	105.0	124.0	94.0	116.0	129.0	113.0	120.0	91.0	94.0		9.0	109.6	14.1	5.0	83.0	111.0	83.0	111.0	117.0	5.0	101.0	16.6	8.3
10	109.0	129.0	103.0	120.0	115.0	120.0	120.0	95.0	94.0		9.0	111.7	12.2	4.3	88.0	126.0	95.0	106.0	120.0	5.0	107.0	16.1	8.0

Single-arm military press @ 70% of NEW 1 RM (Post-training) Heart Rate (bpm)

WTTRAIN GROUP

REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
1	91.0	109.0	80.0	106.0	95.0	94.0	90.0	82.0	75.0		9.0	91.3	11.4	4.0
2	96.0	122.0	94.0	105.0	105.0	94.0	92.0	90.0	75.0		9.0	97.0	12.9	4.6
3	108.0	125.0	90.0	113.0	103.0	94.0	103.0	89.0	88.0		9.0	101.4	12.5	4.4
4	103.0	123.0	97.0	112.0	102.0	100.0	100.0	90.0	88.0		9.0	101.7	10.7	3.8
5	100.0	126.0	89.0	114.0	106.0	106.0	106.0	94.0	88.0		9.0	103.2	12.2	4.3
6	107.0	123.0	100.0	118.0	106.0	106.0	104.0	96.0	90.0		9.0	105.6	10.2	3.6
7	110.0	129.0	94.0	120.0	102.0	116.0	112.0	98.0	90.0		9.0	107.9	12.9	4.5
8	112.0	132.0	105.0	123.0	112.0	111.0	112.0	101.0	96.0		9.0	111.6	10.9	3.8
9	115.0	134.0	106.0	125.0	112.0	120.0	113.0	103.0	98.0		9.0	114.0	11.2	4.0
10	117.0	136.0	113.0	127.0	113.0	117.0	115.0	105.0	101.0		9.0	116.0	10.5	3.7

Single–arm military press @ 70% 1 RM (Pre–training)
Rate–Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	20.1	25.4	18.9	21.5	13.2	21.5	16.0	13.2	15.6	25.3	10.0	19.1	4.5	1.5	16.6	22.7	13.7	17.9	20.2	5.0	18.2	3.4	1.7
2	19.5	22.9	20.3	24.5	10.4	24.2	16.5	15.9	19.8	24.7	10.0	19.9	4.8	1.5	19.3	24.4	14.4	20.1	24.4	5.0	20.5	4.1	2.1
3	23.5	24.8	19.9	25.2	13.4	24.7	15.8	15.6	19.1	26.7	10.0	20.9	4.7	1.6	18.9	24.3	13.4	19.7	24.7	5.0	20.2	4.6	2.3
4	20.3	24.4	22.7	23.9	13.8	25.6	16.5	15.7	19.8	27.2	10.0	21.0	4.5	1.5	21.1	26.4	15.0	21.3	23.5	5.0	21.5	4.2	2.1
5	24.7	25.8	24.4	27.5	15.0	28.7	18.6	19.6	21.5	33.6	10.0	23.9	5.4	1.8	20.3	27.1	17.1	22.1	28.1	5.0	22.9	4.6	2.3
6	22.6	26.0	22.6	28.9	15.3	30.4	18.3	18.7	23.3	31.4	10.0	23.7	5.4	1.8	20.5	32.3	15.9	22.3	25.7	5.0	23.3	6.1	3.1
7	24.4	30.0	26.1	32.3	19.2	27.2	21.5	21.1	24.9	34.8	10.0	26.1	5.0	1.7	22.8	29.1	18.5	25.6	33.9	5.0	26.0	5.9	2.9
8	26.5	31.3	24.8	31.3	18.5	30.9	20.8	19.3	26.2	39.3	10.0	26.9	6.5	2.2	22.4	29.8	21.5	27.5	29.9	5.0	26.2	4.0	2.0
9	27.3	33.4	26.1	31.5	19.8	32.1	23.4	20.2	27.3	42.8	10.0	28.4	6.9	2.3	25.7	29.8	20.6	23.8	28.8	5.0	25.7	3.8	1.9
10	26.6	35.0	28.2	36.1	21.6	33.3	24.2	21.9	29.9	44.3	10.0	30.1	7.2	2.4	23.9	35.3	23.8	28.1	37.7	5.0	29.8	6.4	3.2

Single–arm military press @ 70% of ORIGINAL 1 RM (Post–training)
Rate–Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
1	18.2	24.2	13.7	20.9	18.9	21.8	21.5	13.9	22.5		9.0	19.5	3.7	1.3	15.8	21.4	15.8	21.8	20.4	5.0	19.0	3.0	1.5
2	17.9	24.9	15.9	20.9	16.8	24.0	19.4	15.0	19.2		9.0	19.3	3.4	1.2	15.9	23.9	15.9	20.6	25.4	5.0	20.3	4.4	2.2
3	18.6	23.9	15.4	21.7	20.5	25.4	19.1	17.7	22.9		9.0	20.6	3.2	1.1	16.8	24.0	16.8	22.6	24.5	5.0	20.9	3.8	1.9
4	20.4	27.7	17.4	24.4	19.6	26.6	21.8	16.3	24.4		9.0	22.1	4.0	1.4	17.7	29.3	14.9	26.4	28.0	5.0	23.2	6.5	3.3
5	21.3	26.0	18.1	24.7	19.1	29.3	21.4	21.0	23.6		9.0	22.7	3.5	1.2	19.2	31.8	18.9	27.4	30.7	5.0	25.6	6.2	3.1
6	21.8	28.1	18.8	24.1	23.0	29.9	23.7	18.7	27.7		9.0	24.0	4.0	1.4	19.1	33.4	15.7	27.4	31.9	5.0	25.5	7.8	3.9
7	23.8	29.8	19.2	28.0	23.6	31.5	21.9	18.5	26.8		9.0	24.8	4.5	1.6	21.0	31.2	19.9	30.0	34.6	5.0	27.3	6.5	3.3
8	22.3	28.8	19.5	26.5	21.8	33.0	27.1	20.5	26.8		9.0	25.2	4.4	1.6	19.2	33.6	19.9	30.8	35.6	5.0	27.8	7.7	3.9
9	26.0	31.0	19.2	27.5	25.3	31.6	25.4	20.1	27.2		9.0	25.9	4.2	1.5	20.2	31.9	19.4	34.6	38.2	5.0	28.8	8.6	4.3
10	28.2	33.2	22.1	29.5	25.2	36.8	27.1	20.6	30.3		9.0	28.1	5.1	1.8	23.1	37.9	23.0	32.8	40.2	5.0	31.4	8.1	4.0

Single-arm military press @ 70% of NEW 1 RM (Post-training) Rate-Pressure Product

WTTRAIN GROUP

REP.#	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
1	18.2	25.9	16.0	22.3	14.1	19.7	17.4	14.9	16.2		9.0	18.3	3.8	1.3
2	20.2	24.4	19.6	21.4	14.9	19.8	15.2	15.5	17.6		9.0	18.7	3.2	1.1
3	21.3	27.8	18.7	22.6	16.3	19.4	17.2	17.6	23.8		9.0	20.5	3.7	1.3
4	22.1	28.0	19.6	23.5	20.0	22.2	16.7	17.3	24.8		9.0	21.6	3.6	1.3
5	23.8	29.5	19.0	26.0	20.4	26.0	19.1	19.7	25.0		9.0	23.2	3.8	1.3
6	25.3	30.8	23.3	29.1	18.3	26.4	20.3	20.5	26.1		9.0	24.5	4.2	1.5
7	27.0	34.2	21.4	31.8	19.0	29.3	22.2	21.7	26.0		9.0	25.8	5.2	1.8
8	28.3	34.5	24.4	31.1	24.2	30.0	22.2	23.1	28.7		9.0	27.4	4.2	1.5
9	30.0	35.9	25.8	31.9	26.9	33.6	25.1	24.3	31.2		9.0	29.4	4.1	1.4
10	31.5	37.4	28.8	36.4	26.0	33.0	24.7	25.6	33.2		9.0	30.7	4.7	1.7

Isometric Handgrip @ 50% MVC for 60s (Pre-training)
Peak Systolic BP (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
190.0	241.0	206.0	235.0	218.0	220.0	166.0	203.0	257.0	249.0

N	MEAN	S.D.	SEM
10.0	218.5	28.2	9.4

CONTROL GROUP

A	B	C	D	E
236.0	221.0	202.0	227.0	230.0

N	MEAN	S.D.	SEM
5.0	223.2	13.0	6.5

Isometric Handgrip @ 50% Original MVC for 60s (Post-training)
Peak Systolic BP (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
190.0	234.0	195.0	215.0	168.0	229.0	210.0	198.0	251.0	

N	MEAN	S.D.	SEM
9.0	210.0	25.4	9.0

CONTROL GROUP

A	B	C	D	E
239.0	242.0	185.0	196.0	258.0

N	MEAN	S.D.	SEM
5.0	224.0	31.7	15.8

Isometric Handgrip @ 50% New MVC for 60s (Post-training)
Peak Systolic BP (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
199.0	244.0	211.0	221.0	168.0	229.0	210.0	211.0	266.0	

N	MEAN	S.D.	SEM
9.0	217.7	27.7	9.8

CONTROL GROUP

A	B	C	D	E
231.0	288.0	185.0	196.0	248.0

N	MEAN	S.D.	SEM
5.0	229.6	41.4	20.7

Isometric Handgrip @ 50% MVC for 60s (Pre-training)
Peak Diastolic BP (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
94.0	124.0	106.0	145.0	122.0	111.0	94.0	114.0	115.0	121.0

N	MEAN	S.D.	SEM
10.0	114.6	15.1	5.0

CONTROL GROUP

A	B	C	D	E
138.0	112.0	115.0	114.0	120.0

N	MEAN	S.D.	SEM
5.0	119.8	10.6	5.3

Isometric Handgrip @ 50% Original MVC for 60s (Post-training)
Peak Diastolic BP (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
105.0	137.0	127.0	130.0	96.0	107.0	105.0	106.0	114.0	

N	MEAN	S.D.	SEM
9.0	114.1	13.9	4.9

CONTROL GROUP

A	B	C	D	E
124.0	130.0	102.0	106.0	141.0

N	MEAN	S.D.	SEM
5.0	120.6	16.4	8.2

Isometric Handgrip @ 50% New MVC for 60s (Post-training)
Peak Diastolic BP (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
115.0	145.0	138.0	140.0	96.0	107.0	105.0	109.0	123.0	

N	MEAN	S.D.	SEM
9.0	119.8	17.6	6.2

CONTROL GROUP

A	B	C	D	E
125.0	171.0	102.0	106.0	120.0

N	MEAN	S.D.	SEM
5.0	124.8	27.5	13.8

Isometric Handgrip @ 50% MVC for 60s (Pre-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
117.0	153.0	134.0	160.0	130.0	132.0	107.0	127.0	155.0	135.0

N	MEAN	S.D.	SEM
10.0	135.0	16.9	5.6

CONTROL GROUP

A	B	C	D	E
155.0	134.0	128.0	140.0	140.0

N	MEAN	S.D.	SEM
5.0	139.4	10.0	5.0

Isometric Handgrip @ 50% Original MVC for 60s (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
120.0	148.0	133.0	144.0	113.0	131.0	119.0	109.0	150.0	

N	MEAN	S.D.	SEM
9.0	129.7	15.3	5.4

CONTROL GROUP

A	B	C	D	E
153.0	153.0	120.0	120.0	160.0

N	MEAN	S.D.	SEM
5.0	141.2	19.6	9.8

Isometric Handgrip @ 50% New MVC for 60s (Post-training)
Mean Arterial Pressure (Torr)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J
127.0	158.0	140.0	147.0	113.0	131.0	119.0	120.0	160.0	

N	MEAN	S.D.	SEM
9.0	135.0	17.2	6.1

CONTROL GROUP

A	B	C	D	E
152.0	188.0	120.0	120.0	147.0

N	MEAN	S.D.	SEM
5.0	145.4	28.1	14.0

Isometric Handgrip @ 50% MVC for 60s (Pre-training) Heart Rate (bpm)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
88.0	113.0	81.0	102.0	68.0	86.0	88.0	84.0	67.0	133.0	10.0	91.0	20.2	6.7

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
84.0	83.0	75.0	81.0	89.0	5.0	82.4	5.1	2.5

Isometric Handgrip @ 50% Original MVC for 60s (Post-training) Heart Rate (bpm)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
85.0	118.0	98.0	98.0	84.0	86.0	104.0	79.0	61.0		9.0	90.3	16.4	5.8

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
69.0	100.0	68.0	78.0	95.0	5.0	82.0	14.8	7.4

Isometric Handgrip @ 50% New MVC for 60s (Post-training) Heart Rate (bpm)

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
87.0	119.0	112.0	104.0	84.0	86.0	104.0	84.0	66.0		9.0	94.0	16.8	5.9

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
71.0	111.0	68.0	78.0	97.0	5.0	85.0	18.4	9.2

Isometric Handgrip @ 50% MVC for 60s (Pre-training)
Rate-Pressure Product

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
16.7	27.2	16.7	24.0	14.8	18.9	14.6	17.1	17.2	33.1	10.0	20.0	6.1	2.0

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
19.8	18.3	15.2	18.4	20.5	5.0	18.4	2.1	1.0

Isometric Handgrip @ 50% Original MVC for 60s (Post-training)
Rate-Pressure Product

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
16.2	27.6	19.1	21.1	14.1	19.7	21.8	15.6	15.3		9.0	18.9	4.2	1.5

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
16.5	24.2	12.6	15.3	24.5	5.0	18.6	5.4	2.7

Isometric Handgrip @ 50% New MVC for 60s (Post-training)
Rate-Pressure Product

WTTRAIN GROUP

A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM
17.3	29.0	23.6	23.0	14.1	19.7	21.8	17.7	17.6		9.0	20.4	4.5	1.6

CONTROL GROUP

A	B	C	D	E	N	MEAN	S.D.	SEM
16.4	32.0	12.6	15.3	24.1	5.0	20.1	7.9	4.0

(v) Treadmill (Pre-training) – 4 mins @ 3.0 mph, 8% grade
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	220.0	220.0	220.0	229.0	198.0	226.0	168.0	198.0	253.0	222.0	10.0	215.4	22.8	7.6	244.0	221.0	200.0	234.0	253.0	5.0	230.4	20.7	10.4
1-2	230.0	229.0	215.0	242.0	202.0	245.0	174.0	212.0	254.0	237.0	10.0	224.0	23.8	7.9	253.0	236.0	205.0	240.0	260.0	5.0	238.8	21.2	10.6
2-3	233.0	236.0	219.0	242.0	198.0	246.0	176.0	229.0	263.0	241.0	10.0	228.3	25.1	8.4	259.0	225.0	209.0	239.0	300.0	5.0	246.4	35.2	17.6
3-4	228.0	239.0	215.0	238.0	192.0	251.0	165.0	228.0	263.0	237.0	10.0	225.6	28.7	9.6	251.0	229.0	214.0	236.0	305.0	5.0	247.0	35.0	17.5

Treadmill (Post-training) – 4 mins @ 3.0 mph, 8% grade
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	199.0	215.0	192.0	209.0	170.0	234.0	182.0	208.0	244.0	232.0	10.0	208.5	23.7	7.9	227.0	281.0	202.0	219.0	283.0	5.0	242.4	37.3	16.6
1-2	203.0	216.0	204.0	220.0	182.0	235.0	182.0	223.0	250.0	240.0	10.0	215.5	23.0	7.7	246.0	291.0	208.0	226.0	310.0	5.0	256.2	43.1	21.6
2-3	209.0	219.0	203.0	230.0	195.0	240.0	193.0	234.0	253.0	234.0	10.0	221.0	20.4	6.8	251.0	285.0	209.0	232.0	333.0	5.0	262.0	48.5	24.2
3-4	205.0	215.0	206.0	228.0	182.0	240.0	190.0	242.0	258.0	236.0	10.0	220.2	24.6	8.2	252.0	285.0	210.0	234.0	338.0	5.0	263.8	49.7	24.9

Treadmill (Pre-training) – 4 mins @ 3.0 mph, 8% grade
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
TIME	A	B	C	D	E	F	G	H	I	J					A	B	C	D	E					
(mins)											N	MEAN	S.D.	SEM						N	MEAN	S.D.	SEM
0-1	97.0	103.0	100.0	115.0	94.0	100.0	83.0	98.0	112.0	105.0	10.0	100.7	9.0	3.0	117.0	94.0	92.0	103.0	101.0	5.0	101.4	9.9	4.9
1-2	97.0	101.0	98.0	119.0	99.0	103.0	81.0	88.0	103.0	115.0	10.0	100.4	11.2	3.7	120.0	96.0	94.0	99.0	100.0	5.0	101.8	10.4	5.2
2-3	101.0	111.0	97.0	117.0	92.0	105.0	86.0	97.0	107.0	113.0	10.0	102.6	9.8	3.3	118.0	94.0	93.0	103.0	108.0	5.0	103.2	10.4	5.2
3-4	100.0	106.0	97.0	117.0	93.0	106.0	91.0	94.0	104.0	116.0	10.0	102.4	9.1	3.0	118.0	93.0	92.0	98.0	115.0	5.0	103.2	12.4	6.2

Treadmill (Post-training) – 4 mins @ 3.0 mph, 8% grade
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
TIME	A	B	C	D	E	F	G	H	I	J					A	B	C	D	E					
(mins)											N	MEAN	S.D.	SEM						N	MEAN	S.D.	SEM
0-1	88.0	104.0	90.0	113.0	83.0	100.0	90.0	90.0	100.0	103.0	10.0	96.1	9.3	3.1	103.0	147.0	94.0	97.0	103.0	5.0	108.8	21.7	10.9
1-2	90.0	101.0	92.0	109.0	84.0	100.0	90.0	92.0	101.0	104.0	10.0	96.3	7.8	2.6	106.0	150.0	94.0	100.0	103.0	5.0	110.6	22.5	11.2
2-3	92.0	99.0	96.0	113.0	90.0	100.0	84.0	89.0	98.0	108.0	10.0	96.9	8.8	2.9	112.0	144.0	93.0	107.0	110.0	5.0	113.2	18.8	9.4
3-4	97.0	97.0	95.0	113.0	88.0	100.0	85.0	95.0	99.0	107.0	10.0	97.6	8.2	2.7	111.0	148.0	93.0	101.0	121.0	5.0	114.8	21.3	10.7

Treadmill (Pre-training) – 4 mins @ 3.0 mph, 8% grade
Mean Arterial Pressure

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	120.0	121.0	127.0	147.0	111.0	127.0	100.0	110.0	147.0	120.0	10.0	123.0	15.1	5.0	142.0	127.0	113.0	137.0	131.0	5.0	130.0	11.1	5.5
1-2	123.0	121.0	125.0	151.0	113.0	127.0	97.0	116.0	147.0	126.0	10.0	124.6	15.6	5.2	145.0	129.0	116.0	143.0	133.0	5.0	133.2	11.7	5.9
2-3	127.0	122.0	128.0	149.0	114.0	131.0	93.0	120.0	153.0	122.0	10.0	125.9	17.0	5.7	146.0	125.0	113.0	140.0	141.0	5.0	133.0	13.7	6.8
3-4	120.0	126.0	126.0	147.0	113.0	129.0	98.0	120.0	149.0	126.0	10.0	125.4	14.9	5.0	145.0	129.0	117.0	127.0	148.0	5.0	133.2	13.0	6.5

Treadmill (Post-training) – 4 mins @ 3.0 mph, 8% grade
Mean Arterial Pressure

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	111.0	121.0	115.0	131.0	105.0	127.0	103.0	109.0	130.0	119.0	10.0	117.1	10.2	3.4	134.0	179.0	113.0	120.0	139.0	5.0	137.0	25.7	12.9
1-2	109.0	119.0	114.0	135.0	107.0	130.0	105.0	110.0	134.0	120.0	10.0	118.3	11.3	3.8	140.0	182.0	114.0	128.0	136.0	5.0	140.0	25.5	12.7
2-3	113.0	120.0	116.0	137.0	115.0	133.0	102.0	117.0	144.0	120.0	10.0	121.7	12.6	4.2	145.0	181.0	116.0	129.0	148.0	5.0	143.8	24.5	12.2
3-4	111.0	115.0	117.0	138.0	107.0	133.0	108.0	115.0	140.0	120.0	10.0	120.4	12.2	4.1	140.0	180.0	113.0	127.0	155.0	5.0	143.0	25.9	12.9

Treadmill (Pre-training) – 4 mins @ 3.0 mph, 8% grade
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	119.0	121.0	107.0	113.0	100.0	112.0	104.0	105.0	92.0	131.0	10.0	110.4	11.3	3.8	102.0	98.0	93.0	101.0	100.0	5.0	98.8	3.6	1.8
1-2	129.0	128.0	117.0	119.0	113.0	128.0	113.0	117.0	99.0	140.0	10.0	120.3	11.4	3.8	114.0	105.0	99.0	110.0	108.0	5.0	107.2	5.6	2.8
2-3	131.0	130.0	124.0	122.0	111.0	134.0	117.0	125.0	102.0	143.0	10.0	123.9	11.8	3.9	117.0	106.0	101.0	111.0	113.0	5.0	109.6	6.2	3.1
3-4	131.0	131.0	124.0	123.0	109.0	137.0	116.0	127.0	101.0	145.0	10.0	124.4	13.1	4.4	118.0	105.0	102.0	109.0	117.0	5.0	110.2	7.1	3.6

Treadmill (Post-training) – 4 mins @ 3.0 mph, 8% grade
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	105.0	119.0	98.0	114.0	114.0	109.0	110.0	102.0	88.0	129.0	10.0	108.8	11.4	3.8	94.0	115.0	95.0	99.0	103.0	5.0	101.2	8.5	4.2
1-2	111.0	122.0	107.0	113.0	129.0	118.0	119.0	114.0	97.0	137.0	10.0	116.7	11.2	3.7	105.0	123.0	100.0	110.0	110.0	5.0	109.6	8.6	4.3
2-3	111.0	125.0	111.0	115.0	133.0	125.0	121.0	122.0	100.0	140.0	10.0	120.3	11.6	3.9	108.0	119.0	99.0	111.0	116.0	5.0	110.6	7.8	3.9
3-4	110.0	124.0	113.0	116.0	132.0	127.0	121.0	124.0	99.0	142.0	10.0	120.8	12.1	4.0	111.0	120.0	99.0	113.0	116.0	5.0	111.8	7.9	4.0

MAIN EFFECT GROUP - $p < 0.046$

Treadmill (Pre-training) – 4 mins @ 3.0 mph, 8% grade
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	26.2	26.6	23.5	25.9	19.8	25.3	17.5	20.8	23.3	29.1	10.0	23.8	3.6	1.2	24.9	21.7	18.6	23.6	25.3	5.0	22.8	2.7	1.4
1-2	29.7	29.3	25.2	28.8	22.8	31.4	19.7	24.8	25.2	33.2	10.0	27.0	4.2	1.4	28.8	24.8	20.3	26.4	28.1	5.0	25.7	3.4	1.7
2-3	30.5	30.7	27.2	29.5	22.0	33.0	20.6	28.6	26.8	34.5	10.0	28.3	4.4	1.5	30.3	23.9	21.1	26.5	33.9	5.0	27.1	5.1	2.5
3-4	29.9	31.3	26.7	29.3	20.9	34.4	19.1	29.0	26.6	34.4	10.0	28.1	5.1	1.7	29.6	24.1	21.8	25.7	35.7	5.0	27.4	5.4	2.7

Treadmill (Post-training) – 4 mins @ 3.0 mph, 8% grade
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	20.9	25.6	18.8	23.8	19.4	25.5	20.0	21.2	21.5	29.9	10.0	22.7	3.5	1.2	21.3	32.3	19.2	21.7	29.2	5.0	24.7	5.7	2.8
1-2	22.5	26.4	21.8	24.9	23.5	27.7	21.7	25.4	24.3	32.9	10.0	25.1	3.4	1.1	25.8	35.8	20.8	24.9	34.1	5.0	28.3	6.4	3.2
2-3	23.2	27.4	22.5	26.5	25.9	30.0	23.4	28.6	25.3	32.8	10.0	26.5	3.2	1.1	27.1	33.9	20.7	25.8	38.6	5.0	29.2	7.1	3.5
3-4	22.6	26.7	23.3	26.5	24.0	30.5	23.0	30.0	25.5	33.5	10.0	26.5	3.7	1.2	28.0	34.2	20.8	26.4	39.2	5.0	29.7	7.1	3.6

Treadmill (Pre-training) - 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4-6, 30 lbs mins 8-10
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	205.0	214.0	197.0	232.0	165.0	203.0	170.0	183.0	229.0	209.0	10.0	200.7	22.6	7.5	208.0	199.0	183.0	192.0	237.0	5.0	203.8	20.7	10.4
1-2	190.0	221.0	193.0	209.0	162.0	206.0	181.0	183.0	243.0	215.0	10.0	200.3	23.3	7.8	211.0	204.0	188.0	183.0	247.0	5.0	206.6	25.3	12.7
2-3	193.0	212.0	189.0	206.0	165.0	196.0	177.0	190.0	253.0	223.0	10.0	200.4	24.8	8.3	217.0	200.0	179.0	189.0	261.0	5.0	209.2	32.2	16.1
3-4	209.0	218.0	193.0	209.0	161.0	192.0	181.0	179.0	246.0	220.0	10.0	200.8	24.6	8.2	209.0	196.0	179.0	191.0	243.0	5.0	203.6	24.5	12.3
4-5	208.0	240.0	201.0	214.0	182.0	222.0	167.0	209.0	244.0	226.0	10.0	211.3	24.0	8.0	229.0	213.0	186.0	218.0	249.0	5.0	219.0	23.1	11.5
5-6	212.0	248.0	208.0	219.0	190.0	224.0	175.0	217.0	242.0	232.0	10.0	216.7	22.3	7.4	238.0	218.0	193.0	229.0	254.0	5.0	226.4	22.9	11.4
6-7	206.0	230.0	199.0	209.0	203.0	218.0	167.0	209.0	226.0	213.0	10.0	208.0	17.4	5.8	227.0	207.0	180.0	226.0	246.0	5.0	217.2	25.0	12.5
7-8	187.0	217.0	185.0	200.0	177.0	197.0	161.0	201.0	228.0	206.0	10.0	195.9	19.4	6.5	209.0	196.0	172.0	198.0	273.0	5.0	209.6	37.9	19.0
8-9	227.0	258.0	209.0	236.0	187.0	236.0	176.0	228.0	248.0	228.0	10.0	223.3	25.7	8.6	237.0	215.0	197.0	247.0	262.0	5.0	231.6	25.8	12.9
9-10	236.0	270.0	217.0	244.0	228.0	254.0	188.0	249.0	260.0	250.0	10.0	239.6	23.8	7.5	249.0	234.0	212.0	270.0	280.0	5.0	249.0	27.4	13.7

Treadmill (Post-training) - 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4-6, 30 lbs mins 8-10
Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	178.0	195.0	192.0	199.0	166.0	202.0	161.0	192.0	218.0	205.0	10.0	190.8	17.7	5.9	203.0	253.0	231.0	221.0	249.0	5.0	231.4	20.6	10.3
1-2	183.0	199.0	186.0	196.0	167.0	198.0	163.0	198.0	218.0	205.0	10.0	191.3	16.9	5.6	206.0	253.0	232.0	211.0	235.0	5.0	227.4	19.1	9.6
2-3	188.0	205.0	183.0	197.0	179.0	198.0	159.0	203.0	230.0	204.0	10.0	194.6	18.9	6.3	203.0	256.0	206.0	206.0	251.0	5.0	224.4	26.7	13.3
3-4	186.0	192.0	188.0	210.0	163.0	195.0	158.0	203.0	219.0	207.0	10.0	192.1	19.6	6.5	203.0	248.0	190.0	213.0	255.0	5.0	221.8	28.4	14.2
4-5	191.0	214.0	193.0	205.0	193.0	213.0	165.0	218.0	233.0	220.0	10.0	204.5	19.4	6.5	211.0	259.0	207.0	220.0	256.0	5.0	230.6	25.0	12.5
5-6	199.0	229.0	198.0	211.0	185.0	223.0	173.0	223.0	229.0	231.0	10.0	210.1	20.4	6.6	224.0	271.0	203.0	234.0	281.0	5.0	242.6	32.7	16.3
6-7	185.0	225.0	188.0	203.0	178.0	210.0	167.0	228.0	226.0	216.0	10.0	202.6	21.9	7.3	214.0	263.0	197.0	227.0	281.0	5.0	236.4	34.8	17.4
7-8	178.0	203.0	188.0	201.0	155.0	193.0	161.0	199.0	219.0	210.0	10.0	190.7	20.6	6.9	201.0	267.0	198.0	208.0	263.0	5.0	227.4	34.5	17.3
8-9	211.0	235.0	211.0	220.0	188.0	234.0	171.0	237.0	250.0	222.0	10.0	217.9	23.9	8.0	240.0	279.0	203.0	253.0	290.0	5.0	253.0	34.3	17.2
9-10	218.0	259.0	214.0	226.0	228.0	250.0	200.0	260.0	256.0	248.0	10.0	235.9	21.4	7.1	243.0	287.0	213.0	273.0	303.0	5.0	263.8	36.0	18.0

GROUPxTRAIN INTERACTION - p <0.020 mins 8-10

Treadmill (Pre-training) – 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4–6, 30 lbs mins 8–10
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	93.0	105.0	93.0	138.0	86.0	96.0	90.0	87.0	107.0	108.0	10.0	100.3	15.5	5.2	112.0	97.0	92.0	104.0	111.0	5.0	103.2	8.7	4.4
1-2	92.0	105.0	92.0	123.0	90.0	96.0	100.0	87.0	111.0	133.0	10.0	102.9	15.2	5.1	112.0	98.0	94.0	93.0	114.0	5.0	102.2	10.1	5.0
2-3	96.0	101.0	96.0	118.0	86.0	92.0	94.0	89.0	113.0	152.0	10.0	103.7	19.7	6.6	126.0	101.0	90.0	90.0	106.0	5.0	102.6	14.8	7.4
3-4	97.0	115.0	96.0	116.0	86.0	93.0	100.0	86.0	104.0	133.0	10.0	102.6	14.8	4.9	112.0	95.0	90.0	91.0	98.0	5.0	97.2	8.9	4.4
4-5	97.0	117.0	98.0	120.0	90.0	106.0	88.0	93.0	106.0	123.0	10.0	103.6	12.7	4.2	124.0	97.0	92.0	101.0	108.0	5.0	104.4	12.4	6.2
5-6	99.0	126.0	100.0	119.0	103.0	109.0	94.0	93.0	110.0	113.0	10.0	106.6	10.8	3.6	125.0	99.0	97.0	106.0	108.0	5.0	107.0	11.1	5.5
6-7	99.0	107.0	91.0	122.0	99.0	94.0	89.0	87.0	98.0	106.0	10.0	99.2	10.4	3.5	112.0	97.0	90.0	98.0	98.0	5.0	99.0	8.0	4.0
7-8	91.0	104.0	88.0	111.0	89.0	92.0	86.0	92.0	100.0	115.0	10.0	96.8	10.2	3.4	112.0	94.0	86.0	92.0	120.0	5.0	100.8	14.5	7.2
8-9	104.0	129.0	105.0	126.0	99.0	111.0	94.0	105.0	118.0	121.0	10.0	111.2	11.8	3.8	124.0	100.0	92.0	122.0	114.0	5.0	110.4	14.0	7.0
9-10	115.0	144.0	117.0	135.0	106.0	122.0	100.0	115.0	126.0	140.0	10.0	122.0	14.4	4.6	127.0	102.0	104.0	121.0	120.0	5.0	114.8	11.1	5.6

Treadmill (Post-training) – 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4–6, 30 lbs mins 8–10
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	92.0	101.0	96.0	109.0	86.0	89.0	83.0	84.0	94.0	102.0	10.0	93.6	8.5	2.8	108.0	147.0	119.0	110.0	108.0	5.0	118.4	16.6	8.3
1-2	92.0	96.0	94.0	111.0	89.0	91.0	83.0	85.0	99.0	102.0	10.0	94.2	8.3	2.8	103.0	144.0	113.0	104.0	100.0	5.0	112.8	18.1	9.1
2-3	92.0	98.0	90.0	117.0	92.0	90.0	84.0	90.0	100.0	104.0	10.0	95.7	9.5	3.2	102.0	146.0	99.0	101.0	101.0	5.0	109.8	20.3	10.1
3-4	96.0	99.0	90.0	123.0	90.0	88.0	84.0	90.0	94.0	101.0	10.0	95.5	11.0	3.7	107.0	144.0	94.0	101.0	96.0	5.0	108.4	20.5	10.3
4-5	93.0	104.0	96.0	116.0	97.0	102.0	88.0	95.0	104.0	111.0	10.0	100.6	8.5	2.8	107.0	150.0	100.0	106.0	110.0	5.0	114.6	20.1	10.1
5-6	98.0	114.0	101.0	113.0	90.0	98.0	91.0	101.0	101.0	113.0	10.0	102.0	8.7	2.9	115.0	157.0	103.0	111.0	118.0	5.0	120.8	21.0	10.5
6-7	92.0	114.0	89.0	110.0	91.0	86.0	84.0	87.0	94.0	106.0	10.0	95.3	10.7	3.6	108.0	148.0	99.0	113.0	101.0	5.0	113.8	19.9	10.0
7-8	90.0	97.0	95.0	114.0	84.0	85.0	84.0	87.0	94.0	102.0	10.0	93.2	9.5	3.2	98.0	150.0	101.0	101.0	102.0	5.0	110.4	22.2	11.1
8-9	105.0	120.0	106.0	123.0	97.0	102.0	97.0	106.0	111.0	109.0	10.0	107.6	8.6	2.9	111.0	160.0	100.0	125.0	121.0	5.0	123.4	22.6	11.3
9-10	105.0	138.0	108.0	126.0	111.0	114.0	95.0	113.0	114.0	120.0	10.0	114.4	11.7	3.9	126.0	164.0	111.0	128.0	116.0	5.0	129.0	20.8	10.4

GROUPxTIME INTERACTION - p <0.009 mins 1-4

Treadmill (Pre-training) – 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4–6, 30 lbs mins 8–10
Mean Arterial Pressure (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	116.0	127.0	122.0	143.0	105.0	119.0	105.0	105.0	141.0	121.0	10.0	120.4	13.8	4.6	137.0	120.0	114.0	120.0	133.0	5.0	124.8	9.7	4.9
1-2	113.0	127.0	119.0	141.0	103.0	123.0	106.0	105.0	149.0	131.0	10.0	121.7	15.6	5.2	137.0	120.0	111.0	118.0	134.0	5.0	124.0	11.1	5.5
2-3	116.0	125.0	117.0	140.0	98.0	116.0	107.0	105.0	148.0	133.0	10.0	120.5	16.0	5.3	140.0	120.0	109.0	119.0	133.0	5.0	124.2	12.3	6.1
3-4	120.0	129.0	120.0	140.0	100.0	119.0	113.0	103.0	143.0	133.0	10.0	122.0	14.4	4.8	133.0	119.0	109.0	119.0	133.0	5.0	122.6	10.3	5.2
4-5	120.0	139.0	129.0	147.0	102.0	130.0	100.0	112.0	149.0	133.0	10.0	126.1	17.3	5.8	145.0	130.0	116.0	132.0	137.0	5.0	132.0	10.7	5.3
5-6	126.0	148.0	131.0	147.0	112.0	133.0	106.0	117.0	147.0	133.0	10.0	130.0	14.9	5.0	153.0	133.0	120.0	140.0	136.0	5.0	136.4	11.8	6.0
6-7	115.0	129.0	115.0	140.0	107.0	120.0	101.0	102.0	140.0	117.0	10.0	118.6	14.0	4.7	140.0	120.0	107.0	125.0	129.0	5.0	124.2	12.1	6.1
7-8	113.0	123.0	115.0	138.0	100.0	120.0	97.0	107.0	140.0	120.0	10.0	117.3	14.3	4.8	134.0	117.0	105.0	119.0	141.0	5.0	123.2	14.3	7.2
8-9	127.0	146.0	130.0	152.0	113.0	136.0	107.0	120.0	150.0	131.0	10.0	131.2	15.2	5.1	153.0	130.0	115.0	145.0	143.0	5.0	137.2	14.9	7.5
9-10	139.0	167.0	144.0	161.0	132.0	153.0	113.0	138.0	159.0	140.0	10.0	144.6	16.0	5.3	160.0	140.0	127.0	166.0	153.0	5.0	149.2	15.7	7.9

Treadmill (Post-training) – 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4–6, 30 lbs mins 8–10
Mean Arterial Pressure (Torr)

	WTTRAIN GROUP														CONTROL GROUP								
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	113.0	119.0	119.0	132.0	107.0	119.0	107.0	103.0	127.0	117.0	10.0	116.3	9.1	3.0	140.0	175.0	147.0	127.0	133.0	5.0	144.4	18.7	9.3
1-2	111.0	120.0	116.0	133.0	107.0	120.0	107.0	105.0	127.0	119.0	10.0	116.5	9.2	3.1	138.0	180.0	133.0	123.0	133.0	5.0	141.4	22.3	11.1
2-3	110.0	120.0	113.0	133.0	108.0	120.0	105.0	103.0	127.0	117.0	10.0	115.6	9.7	3.2	137.0	180.0	120.0	120.0	137.0	5.0	138.8	24.5	12.3
3-4	113.0	120.0	113.0	139.0	103.0	115.0	103.0	107.0	127.0	119.0	10.0	115.9	11.1	3.7	137.0	179.0	117.0	122.0	135.0	5.0	138.0	24.4	12.2
4-5	113.0	126.0	125.0	138.0	108.0	127.0	108.0	113.0	140.0	124.0	10.0	122.2	11.5	3.6	143.0	182.0	122.0	129.0	138.0	5.0	142.8	23.4	11.7
5-6	120.0	140.0	123.0	141.0	113.0	133.0	112.0	117.0	135.0	131.0	10.0	126.5	10.9	3.6	147.0	187.0	121.0	139.0	147.0	5.0	148.2	24.1	12.1
6-7	107.0	120.0	113.0	133.0	103.0	118.0	107.0	103.0	130.0	114.0	10.0	114.8	10.6	3.5	137.0	181.0	113.0	121.0	135.0	5.0	137.4	26.3	13.2
7-8	107.0	120.0	113.0	133.0	97.0	111.0	106.0	100.0	128.0	113.0	10.0	112.8	11.5	3.8	133.0	181.0	114.0	117.0	135.0	5.0	136.0	26.8	13.4
8-9	120.0	135.0	127.0	147.0	112.0	135.0	111.0	120.0	147.0	123.0	10.0	127.7	13.0	4.3	147.0	187.0	123.0	143.0	147.0	5.0	149.4	23.3	11.6
9-10	133.0	160.0	141.0	157.0	134.0	153.0	126.0	135.0	155.0	136.0	10.0	143.0	12.1	4.0	163.0	199.0	132.0	160.0	158.0	5.0	162.4	23.9	12.0

Treadmill (Pre–training) – 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4–6, 30 lbs mins 8–10
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP								
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	105.0	115.0	92.0	101.0	75.0	98.0	96.0	99.0	77.0	120.0	10.0	97.8	14.3	4.8	90.0	81.0	77.0	88.0	90.0	5.0	85.2	5.9	2.9
1-2	103.0	114.0	94.0	96.0	73.0	98.0	95.0	99.0	77.0	123.0	10.0	97.2	14.9	5.0	90.0	79.0	77.0	85.0	92.0	5.0	84.6	6.6	3.3
2-3	103.0	114.0	94.0	99.0	73.0	95.0	95.0	99.0	74.0	121.0	10.0	96.7	15.0	5.0	90.0	77.0	76.0	86.0	98.0	5.0	85.4	9.2	4.6
3-4	105.0	117.0	96.0	97.0	72.0	97.0	97.0	101.0	73.0	124.0	10.0	97.9	16.3	5.4	92.0	78.0	76.0	86.0	94.0	5.0	85.2	8.1	4.0
4-5	110.0	119.0	103.0	104.0	82.0	102.0	101.0	109.0	80.0	130.0	10.0	104.0	15.0	5.0	96.0	87.0	81.0	94.0	100.0	5.0	91.6	7.6	3.8
5-6	109.0	123.0	105.0	104.0	84.0	105.0	100.0	113.0	81.0	133.0	10.0	105.7	15.7	5.2	94.0	85.0	83.0	95.0	101.0	5.0	91.6	7.5	3.7
6-7	106.0	119.0	100.0	101.0	77.0	101.0	99.0	111.0	75.0	132.0	10.0	102.1	17.2	5.7	90.0	81.0	79.0	89.0	96.0	5.0	87.0	7.0	3.5
7-8	104.0	116.0	97.0	98.0	72.0	99.0	94.0	110.0	73.0	130.0	10.0	99.3	17.7	5.9	91.0	76.0	75.0	87.0	98.0	5.0	85.4	9.9	4.9
8-9	112.0	123.0	109.0	108.0	88.0	108.0	106.0	117.0	85.0	135.0	10.0	109.1	14.8	4.9	100.0	87.0	83.0	97.0	103.0	5.0	94.0	8.6	4.3
9-10	115.0	129.0	115.0	115.0	91.0	117.0	107.0	122.0	89.0	139.0	10.0	113.9	15.4	5.1	107.0	91.0	86.0	100.0	109.0	5.0	98.6	10.0	5.0

Treadmill (Post–training) – 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4–6, 30 lbs mins 8–10
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP								
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	90.0	111.0	84.0	96.0	101.0	90.0	95.0	99.0	69.0	120.0	10.0	95.5	14.1	4.7	79.0	99.0	87.0	93.0	96.0	5.0	90.8	7.9	4.0
1-2	89.0	110.0	86.0	93.0	101.0	89.0	99.0	102.0	70.0	118.0	10.0	95.7	13.5	4.5	79.0	97.0	84.0	91.0	97.0	5.0	89.6	8.0	4.0
2-3	87.0	110.0	85.0	93.0	103.0	88.0	97.0	102.0	70.0	119.0	10.0	95.4	14.0	4.7	79.0	97.0	81.0	90.0	99.0	5.0	89.2	9.1	4.5
3-4	91.0	111.0	86.0	95.0	100.0	86.0	98.0	103.0	67.0	120.0	10.0	95.7	14.7	4.9	79.0	95.0	84.0	91.0	98.0	5.0	89.4	7.8	3.9
4-5	93.0	114.0	91.0	97.0	107.0	93.0	102.0	112.0	77.0	126.0	10.0	101.2	14.0	4.7	85.0	101.0	86.0	94.0	103.0	5.0	93.8	8.3	4.1
5-6	95.0	118.0	95.0	101.0	108.0	95.0	103.0	113.0	76.0	129.0	10.0	103.3	14.7	4.9	86.0	101.0	87.0	95.0	107.0	5.0	95.2	9.0	4.5
6-7	91.0	113.0	90.0	97.0	102.0	88.0	100.0	109.0	72.0	123.0	10.0	98.5	14.4	4.8	85.0	97.0	84.0	93.0	101.0	5.0	92.0	7.4	3.7
7-8	86.0	112.0	89.0	94.0	99.0	86.0	99.0	108.0	69.0	120.0	10.0	96.2	14.8	4.9	82.0	93.0	81.0	92.0	99.0	5.0	89.4	7.7	3.9
8-9	99.0	118.0	97.0	105.0	108.0	97.0	104.0	117.0	84.0	127.0	10.0	105.6	12.6	4.2	90.0	105.0	88.0	100.0	109.0	5.0	98.4	9.2	4.6
9-10	98.0	124.0	103.0	110.0	110.0	105.0	108.0	120.0	90.0	131.0	10.0	109.9	12.3	4.1	91.0	111.0	91.0	104.0	112.0	5.0	101.8	10.3	5.2

Treadmill (Pre-training) – 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4–6, 30 lbs mins 8–10
Rate–Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	21.5	24.6	18.1	23.4	12.4	19.9	16.3	18.1	17.6	25.1	10.0	19.7	4.0	1.3	18.7	16.1	14.1	16.9	21.3	5.0	17.4	2.7	1.4
1-2	19.6	25.2	18.1	20.1	11.8	20.2	17.2	18.1	18.7	26.5	10.0	19.5	4.1	1.4	19.0	16.1	14.5	15.6	22.7	5.0	17.6	3.3	1.7
2-3	19.9	24.2	17.8	20.4	12.1	18.6	16.8	18.8	18.7	27.0	10.0	19.4	4.0	1.3	19.5	15.4	13.6	16.3	25.6	5.0	18.1	4.7	2.4
3-4	22.0	25.5	18.5	20.3	11.6	18.6	17.6	18.1	18.0	27.3	10.0	19.7	4.4	1.5	19.2	15.3	13.6	16.4	22.8	5.0	17.5	3.6	1.8
4-5	22.9	28.6	20.7	22.3	14.9	22.6	16.9	22.8	19.5	29.4	10.0	22.1	4.5	1.5	22.0	18.5	15.1	20.5	24.9	5.0	20.2	3.7	1.8
5-6	23.1	30.5	21.8	22.8	16.0	23.5	17.5	24.5	19.6	30.9	10.0	23.0	4.9	1.6	22.4	18.5	16.0	21.8	25.7	5.0	20.9	3.7	1.9
6-7	21.8	27.4	19.9	21.1	15.6	22.0	16.5	23.2	17.0	28.1	10.0	21.3	4.3	1.4	20.4	16.8	14.2	20.1	23.6	5.0	19.0	3.6	1.8
7-8	19.5	25.2	18.0	19.6	12.7	19.5	15.1	22.1	16.6	26.8	10.0	19.5	4.3	1.4	19.0	14.9	12.9	17.2	26.8	5.0	18.2	5.3	2.7
8-9	25.4	31.7	22.8	25.5	16.5	25.5	18.7	26.7	21.1	30.8	10.0	24.5	4.9	1.6	23.7	18.7	16.4	24.0	27.0	5.0	21.9	4.3	2.2
9-10	27.1	34.8	25.0	28.1	20.8	29.7	20.1	30.4	23.1	34.8	10.0	27.4	5.2	1.7	26.6	21.3	18.2	27.0	30.5	5.0	24.7	4.9	2.5

Treadmill (Post-training) – 10 mins @ 2.5 mph, 0% grade carrying 20 lbs between mins 4–6, 30 lbs mins 8–10
Rate–Pressure Product

	WTTRAIN GROUP														CONTROL GROUP									
TIME (mins)	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	16.0	21.7	16.1	19.1	16.8	18.2	15.3	19.0	15.0	24.6	10.0	18.2	3.1	1.0	16.0	25.1	20.1	20.6	23.9	5.0	21.1	3.5	1.8
1-2	16.3	21.9	16.0	18.2	16.9	17.6	16.1	20.2	15.3	24.2	10.0	18.3	2.9	1.0	16.3	24.5	19.5	19.2	22.8	5.0	20.5	3.2	1.6
2-3	16.4	22.6	15.6	18.3	18.4	17.4	15.4	20.7	16.1	24.3	10.0	18.5	3.1	1.0	16.0	24.8	16.7	18.5	24.9	5.0	20.2	4.3	2.2
3-4	16.9	21.3	16.2	20.0	16.3	16.8	15.5	20.9	14.7	24.8	10.0	18.3	3.3	1.1	16.0	23.6	15.9	19.4	25.0	5.0	20.0	4.2	2.1
4-5	17.8	24.2	17.6	19.9	20.7	19.8	16.6	24.4	17.9	27.7	10.0	20.7	3.6	1.2	17.9	26.2	17.8	20.7	26.4	5.0	21.8	4.2	2.1
5-6	18.9	27.0	18.8	21.3	20.0	21.2	17.6	26.3	17.4	29.8	10.0	21.9	4.3	1.4	19.3	27.4	17.7	22.2	30.1	5.0	23.3	5.3	2.6
6-7	16.8	25.4	16.9	19.7	18.2	18.5	16.7	24.9	16.3	26.6	10.0	20.0	4.0	1.3	18.2	25.5	16.6	21.1	28.4	5.0	21.9	5.0	2.5
7-8	15.3	22.7	16.7	18.9	15.4	16.6	15.9	21.5	15.1	25.2	10.0	18.3	3.6	1.2	16.5	24.8	16.0	19.1	26.0	5.0	20.5	4.7	2.3
8-9	20.9	27.7	20.5	23.1	20.3	22.7	17.8	27.7	21.0	28.2	10.0	23.0	3.7	1.2	21.6	29.3	17.9	25.3	31.6	5.0	25.1	5.6	2.8
9-10	21.4	32.1	22.0	24.9	25.1	26.3	21.6	31.2	23.0	32.5	10.0	26.0	4.4	1.6	22.1	31.9	19.4	28.4	33.9	5.0	27.1	6.2	3.1

GROUPxTRAIN INTERACTION - p <0.040 mins 1-4

(vi) Stairmaster Ergometer @ 60 steps/min (Pre-training) Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	178.0	210.0	177.0	202.0	171.0	216.0	147.0	179.0	215.0	235.0	10.0	193.0	26.7	8.9	224.0	193.0	175.0	194.0	212.0	5.0	199.6	18.9	9.5
1-2	180.0	210.0	180.0	203.0	181.0	216.0	149.0	188.0	229.0	195.0	10.0	193.1	22.8	7.6	235.0	201.0	173.0	202.0	236.0	5.0	209.4	26.5	13.3
2-3	183.0	227.0	187.0	216.0	179.0	227.0	165.0	196.0	247.0	214.0	10.0	204.1	26.0	8.7	251.0	210.0	178.0	222.0	243.0	5.0	220.8	29.0	14.5
3-4	188.0	239.0	193.0	234.0	205.0	236.0	180.0	209.0	267.0	223.0	10.0	217.4	27.2	9.1	263.0	228.0	190.0	241.0	258.0	5.0	236.0	29.2	14.6
4-5	205.0	252.0	193.0	244.0	203.0	251.0	200.0	231.0	275.0	240.0	10.0	229.4	27.6	9.2	280.0	241.0	208.0	256.0	272.0	5.0	251.4	28.5	14.3
5-6	213.0	267.0	205.0	247.0	205.0	268.0	202.0	237.0	282.0	259.0	10.0	238.5	30.4	10.1	277.0	242.0	229.0	267.0	288.0	5.0	260.6	24.5	12.3
6-7	218.0	271.0	215.0	254.0	215.0	272.0	211.0	250.0	289.0	267.0	10.0	246.2	29.1	9.7	291.0	248.0	223.0	264.0	296.0	5.0	264.4	30.4	15.2
7-8	223.0	283.0	215.0	260.0	221.0	275.0	213.0	262.0	296.0	291.0	10.0	253.9	32.9	11.0	291.0	257.0	237.0	270.0	300.0	5.0	271.0	25.5	12.7
8-9	223.0	279.0	216.0	264.0	220.0	284.0	219.0	274.0	308.0	284.0	10.0	257.1	34.2	11.4	297.0	260.0	252.0	274.0	315.0	5.0	279.6	26.1	13.1
9-10	229.0	283.0	220.0	264.0	218.0	289.0	224.0	287.0	308.0	293.0	10.0	261.5	35.1	11.7	294.0	264.0	253.0	275.0	315.0	5.0	280.2	24.7	12.3
10-11	233.0	285.0	213.0	265.0	223.0	279.0	219.0	299.0	329.0	300.0	10.0	264.5	40.4	13.5	294.0	260.0	261.0	272.0	324.0	5.0	282.2	27.1	13.5
11-12	236.0	280.0	217.0	271.0	227.0	289.0	221.0	311.0	339.0	313.0	10.0	270.4	43.4	14.5	297.0	265.0	267.0	277.0	343.0	5.0	289.8	32.3	16.2

Stairmaster Ergometer @ 60 steps/min (Post-training) Peak Systolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	166.0	211.0	180.0	201.0	175.0	206.0	165.0	185.0	230.0	210.0	10.0	192.9	21.8	7.3	204.0	258.0	175.0	184.0	247.0	5.0	213.6	37.2	16.6
1-2	174.0	208.0	180.0	205.0	173.0	218.0	169.0	197.0	238.0	197.0	10.0	195.9	22.3	7.4	240.0	254.0	174.0	200.0	273.0	5.0	228.2	40.4	20.2
2-3	178.0	217.0	200.0	220.0	190.0	222.0	179.0	206.0	257.0	211.0	10.0	208.0	23.5	7.8	252.0	273.0	181.0	226.0	279.0	5.0	242.2	40.0	20.0
3-4	196.0	224.0	204.0	237.0	206.0	245.0	190.0	223.0	270.0	223.0	10.0	221.8	24.4	8.1	267.0	285.0	195.0	245.0	285.0	5.0	255.4	37.6	18.8
4-5	204.0	232.0	217.0	247.0	205.0	253.0	205.0	226.0	291.0	232.0	10.0	231.2	27.2	9.1	266.0	306.0	209.0	256.0	321.0	5.0	271.6	44.2	22.1
5-6	203.0	254.0	222.0	250.0	216.0	265.0	200.0	243.0	289.0	254.0	10.0	239.6	28.7	9.6	283.0	319.0	216.0	273.0	338.0	5.0	285.8	47.1	23.5
6-7	213.0	255.0	228.0	258.0	215.0	273.0	213.0	247.0	300.0	266.0	10.0	246.8	29.3	9.8	291.0	325.0	234.0	277.0	339.0	5.0	293.2	41.5	20.7
7-8	229.0	262.0	231.0	258.0	219.0	278.0	217.0	254.0	311.0	275.0	10.0	253.4	30.0	10.0	304.0	328.0	239.0	277.0	339.0	5.0	297.4	40.4	20.2
8-9	235.0	266.0	227.0	256.0	221.0	278.0	218.0	253.0	314.0	294.0	10.0	256.2	32.2	10.7	310.0	335.0	249.0	277.0	340.0	5.0	302.2	38.8	19.4
9-10	234.0	273.0	226.0	262.0	223.0	284.0	221.0	270.0	317.0	307.0	10.0	261.7	35.0	11.7	310.0	332.0	259.0	288.0	340.0	5.0	305.8	33.1	16.5
10-11	238.0	273.0	232.0	264.0	230.0	282.0	226.0	271.0	337.0	306.0	10.0	265.9	36.2	12.1	314.0	337.0	253.0	284.0	341.0	5.0	305.8	37.2	16.6
11-12	236.0	272.0	231.0	268.0	224.0	287.0	229.0	269.0	347.0	310.0	10.0	267.3	39.8	13.3	316.0	333.0	266.0	290.0	342.0	5.0	309.4	31.3	15.7

MAIN EFFECT TRAIN - $p < 0.025$

Stairmaster Ergometer @ 60 steps/min (Pre–training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	89.0	111.0	86.0	114.0	94.0	103.0	97.0	85.0	97.0	127.0	10.0	100.3	13.5	4.5	112.0	93.0	88.0	99.0	106.0	5.0	99.6	9.7	4.8
1-2	80.0	96.0	86.0	107.0	87.0	93.0	98.0	86.0	98.0	94.0	10.0	92.5	7.9	2.6	112.0	93.0	86.0	97.0	103.0	5.0	98.2	9.9	4.9
2-3	84.0	103.0	82.0	103.0	85.0	95.0	88.0	86.0	98.0	93.0	10.0	91.7	7.8	2.6	106.0	85.0	84.0	97.0	97.0	5.0	93.8	9.3	4.6
3-4	83.0	99.0	87.0	115.0	100.0	104.0	89.0	92.0	103.0	100.0	10.0	97.2	9.5	3.2	112.0	88.0	89.0	105.0	98.0	5.0	98.4	10.3	5.2
4-5	86.0	107.0	113.0	118.0	103.0	115.0	101.0	92.0	107.0	110.0	10.0	105.2	10.1	3.4	118.0	91.0	92.0	105.0	108.0	5.0	102.8	11.4	5.7
5-6	91.0	113.0	111.0	121.0	96.0	116.0	136.0	105.0	110.0	107.0	10.0	110.6	12.6	4.2	118.0	93.0	99.0	128.0	111.0	5.0	109.8	14.1	7.1
6-7	91.0	112.0	111.0	124.0	97.0	122.0	123.0	103.0	117.0	117.0	10.0	111.7	11.4	3.8	121.0	94.0	96.0	113.0	114.0	5.0	107.6	11.9	6.0
7-8	96.0	120.0	103.0	125.0	97.0	122.0	100.0	107.0	121.0	120.0	10.0	111.1	11.6	3.9	123.0	98.0	111.0	117.0	119.0	5.0	113.6	9.7	4.9
8-9	91.0	121.0	105.0	141.0	103.0	124.0	104.0	110.0	124.0	121.0	10.0	114.4	14.4	4.8	124.0	99.0	111.0	118.0	121.0	5.0	114.6	10.0	5.0
9-10	103.0	123.0	108.0	131.0	100.0	125.0	99.0	114.0	125.0	123.0	10.0	115.1	11.8	3.9	121.0	94.0	108.0	121.0	125.0	5.0	113.8	12.8	6.4
10-11	96.0	123.0	127.0	133.0	99.0	133.0	106.0	117.0	130.0	128.0	10.0	119.2	14.0	4.7	123.0	94.0	113.0	118.0	138.0	5.0	117.2	16.0	8.0
11-12	99.0	123.0	119.0	137.0	111.0	129.0	132.0	121.0	134.0	129.0	10.0	123.4	11.6	3.9	123.0	99.0	111.0	117.0	144.0	5.0	118.8	16.6	8.3

Stairmaster Ergometer @ 60 steps/min (Post–training)
Peak Diastolic BP (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	89.0	98.0	90.0	114.0	90.0	92.0	93.0	85.0	113.0	102.0	10.0	96.6	10.1	3.4	97.0	143.0	88.0	91.0	109.0	5.0	105.6	22.4	11.2
1-2	78.0	95.0	86.0	104.0	96.0	89.0	88.0	88.0	100.0	95.0	10.0	91.9	7.6	2.5	107.0	138.0	85.0	94.0	108.0	5.0	106.4	20.1	10.0
2-3	79.0	92.0	82.0	106.0	90.0	87.0	88.0	87.0	104.0	93.0	10.0	90.8	8.6	2.9	103.0	134.0	81.0	100.0	110.0	5.0	105.6	19.2	9.6
3-4	80.0	100.0	84.0	110.0	90.0	98.0	90.0	88.0	104.0	97.0	10.0	94.1	9.3	3.1	102.0	137.0	88.0	101.0	104.0	5.0	106.4	18.2	9.1
4-5	85.0	104.0	84.0	120.0	90.0	105.0	93.0	101.0	116.0	101.0	10.0	99.9	12.2	4.1	112.0	148.0	94.0	111.0	113.0	5.0	115.6	19.7	9.9
5-6	85.0	108.0	91.0	121.0	92.0	109.0	95.0	95.0	118.0	114.0	10.0	102.8	12.7	4.2	116.0	149.0	102.0	119.0	119.0	5.0	121.0	17.2	8.6
6-7	82.0	115.0	93.0	123.0	95.0	114.0	102.0	95.0	118.0	119.0	10.0	105.6	13.9	4.6	111.0	151.0	102.0	131.0	113.0	5.0	121.6	19.5	9.8
7-8	92.0	115.0	98.0	134.0	96.0	117.0	104.0	106.0	131.0	115.0	10.0	110.8	14.2	4.7	117.0	151.0	104.0	123.0	121.0	5.0	123.2	17.2	8.6
8-9	94.0	111.0	99.0	128.0	96.0	119.0	114.0	105.0	130.0	131.0	10.0	112.7	14.1	4.7	114.0	156.0	111.0	123.0	122.0	5.0	125.2	18.0	9.0
9-10	92.0	119.0	97.0	129.0	96.0	120.0	114.0	121.0	131.0	127.0	10.0	114.6	14.5	4.8	118.0	156.0	115.0	130.0	126.0	5.0	129.0	16.2	8.1
10-11	92.0	116.0	102.0	131.0	101.0	122.0	120.0	124.0	135.0	126.0	10.0	116.9	14.1	4.7	118.0	150.0	119.0	131.0	133.0	5.0	130.2	13.0	6.5
11-12	94.0	117.0	100.0	135.0	100.0	127.0	120.0	122.0	138.0	131.0	10.0	118.4	15.6	5.2	121.0	152.0	111.0	130.0	129.0	5.0	128.6	15.1	7.8

Stairmaster Ergometer @ 60 steps/min (Pre-training)
Mean Arterial Pressure (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	110.0	118.0	118.0	142.0	111.0	131.0	101.0	109.0	134.0	101.0	10.0	117.5	14.0	4.7	145.0	120.0	117.0	120.0	138.0	5.0	128.0	12.6	6.3
1-2	104.0	115.0	111.0	131.0	112.0	129.0	84.0	109.0	145.0	113.0	10.0	115.3	16.7	5.6	145.0	113.0	107.0	129.0	132.0	5.0	125.2	15.3	7.6
2-3	103.0	126.0	115.0	138.0	124.0	133.0	99.0	119.0	142.0	111.0	10.0	121.0	14.4	4.8	142.0	130.0	108.0	135.0	127.0	5.0	128.4	12.7	6.4
3-4	117.0	125.0	113.0	141.0	117.0	132.0	110.0	115.0	156.0	122.0	10.0	124.8	14.4	4.8	147.0	131.0	108.0	147.0	133.0	5.0	133.2	16.0	8.0
4-5	102.0	132.0	121.0	143.0	118.0	148.0	115.0	124.0	166.0	122.0	10.0	129.1	18.6	6.2	156.0	145.0	119.0	150.0	147.0	5.0	143.4	14.3	7.1
5-6	111.0	144.0	131.0	151.0	125.0	157.0	132.0	134.0	171.0	133.0	10.0	138.9	17.2	5.7	156.0	133.0	125.0	163.0	148.0	5.0	145.0	15.8	7.9
6-7	124.0	146.0	124.0	158.0	124.0	158.0	128.0	135.0	173.0	148.0	10.0	141.8	17.5	5.8	162.0	149.0	126.0	159.0	155.0	5.0	150.2	14.4	7.2
7-8	114.0	153.0	143.0	166.0	122.0	156.0	108.0	140.0	176.0	142.0	10.0	142.0	22.1	7.4	168.0	144.0	136.0	167.0	158.0	5.0	154.6	14.2	7.1
8-9	121.0	153.0	128.0	163.0	127.0	165.0	125.0	145.0	179.0	153.0	10.0	145.9	20.0	6.7	160.0	146.0	138.0	158.0	163.0	5.0	153.0	10.6	5.3
9-10	123.0	163.0	139.0	162.0	124.0	162.0	130.0	149.0	194.0	151.0	10.0	149.7	21.9	7.3	172.0	151.0	148.0	173.0	166.0	5.0	162.0	11.8	5.9
10-11	125.0	151.0	138.0	157.0	128.0	177.0	125.0	154.0	196.0	162.0	10.0	151.3	23.4	7.8	179.0	150.0	140.0	177.0	167.0	5.0	162.6	17.1	8.5
11-12	129.0	167.0	144.0	165.0	133.0	170.0	132.0	159.0	202.0	164.0	10.0	156.5	22.5	7.5	169.0	150.0	138.0	164.0	177.0	5.0	159.6	15.6	7.8

Stairmaster Ergometer @ 60 steps/min (Post-training)
Mean Arterial Pressure (Torr)

	WTTRAIN GROUP														CONTROL GROUP									
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	108.0	123.0	113.0	121.0	111.0	130.0	101.0	104.0	135.0	121.0	10.0	116.7	11.1	3.7	148.0	176.0	114.0	118.0	150.0	5.0	141.2	25.6	12.8
1-2	108.0	121.0	117.0	134.0	106.0	119.0	103.0	104.0	143.0	112.0	10.0	116.7	13.2	4.4	149.0	182.0	103.0	127.0	135.0	5.0	139.2	29.2	14.6
2-3	103.0	121.0	108.0	137.0	110.0	122.0	108.0	107.0	147.0	115.0	10.0	117.8	14.3	4.8	141.0	179.0	107.0	132.0	152.0	5.0	142.2	26.4	13.2
3-4	109.0	117.0	117.0	144.0	117.0	140.0	115.0	120.0	148.0	113.0	10.0	124.0	14.2	4.7	152.0	183.0	110.0	130.0	137.0	5.0	142.4	27.3	13.6
4-5	117.0	129.0	123.0	142.0	119.0	145.0	106.0	116.0	157.0	126.0	10.0	128.0	15.6	5.2	167.0	204.0	121.0	150.0	156.0	5.0	159.6	30.1	15.0
5-6	111.0	138.0	127.0	150.0	118.0	155.0	124.0	124.0	150.0	150.0	10.0	134.7	15.8	5.3	164.0	181.0	128.0	146.0	167.0	5.0	157.2	20.5	10.3
6-7	116.0	139.0	128.0	161.0	129.0	162.0	133.0	129.0	158.0	158.0	10.0	141.3	16.9	5.6	159.0	201.0	138.0	161.0	160.0	5.0	163.8	22.9	11.4
7-8	126.0	142.0	128.0	149.0	128.0	168.0	129.0	127.0	181.0	146.0	10.0	142.4	19.2	6.4	182.0	205.0	127.0	167.0	174.0	5.0	171.0	28.5	14.2
8-9	120.0	137.0	138.0	153.0	121.0	165.0	141.0	135.0	184.0	154.0	10.0	144.8	19.7	6.6	168.0	203.0	141.0	165.0	175.0	5.0	170.4	22.3	11.1
9-10	129.0	150.0	131.0	164.0	132.0	177.0	170.0	139.0	188.0	158.0	10.0	153.8	20.9	7.0	175.0	200.0	147.0	165.0	181.0	5.0	173.6	19.6	9.8
10-11	116.0	146.0	133.0	165.0	124.0	166.0	134.0	138.0	190.0	158.0	10.0	147.0	22.6	7.5	177.0	201.0	147.0	173.0	177.0	5.0	175.0	19.2	9.6
11-12	125.0	155.0	145.0	168.0	126.0	171.0	147.0	133.0	196.0	159.0	10.0	152.6	22.2	7.4	176.0	203.0	140.0	173.0	188.0	5.0	176.0	23.3	11.7

Stairmaster Ergometer @ 60 steps/min (Pre-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP								
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	99.0	117.0	94.0	107.0	85.0	100.0	100.0	104.0	83.0	120.0	10.0	100.9	12.0	4.0	100.0	81.0	83.0	90.0	93.0	5.0	89.4	7.7	3.9
1-2	104.0	123.0	100.0	109.0	98.0	112.0	105.0	117.0	91.0	128.0	10.0	108.7	11.5	3.8	109.0	95.0	88.0	103.0	103.0	5.0	99.6	8.2	4.1
2-3	115.0	126.0	113.0	120.0	106.0	120.0	111.0	121.0	107.0	135.0	10.0	117.4	8.9	3.0	120.0	105.0	96.0	110.0	106.0	5.0	107.4	8.7	4.4
3-4	118.0	134.0	118.0	127.0	117.0	131.0	117.0	125.0	113.0	140.0	10.0	124.0	8.9	3.0	125.0	112.0	105.0	118.0	112.0	5.0	114.4	7.5	3.8
4-5	123.0	137.0	121.0	132.0	125.0	136.0	128.0	129.0	124.0	146.0	10.0	130.1	7.8	2.6	132.0	118.0	108.0	124.0	119.0	5.0	120.2	8.8	4.4
5-6	130.0	144.0	130.0	136.0	128.0	148.0	130.0	135.0	126.0	147.0	10.0	135.4	8.2	2.7	136.0	119.0	116.0	128.0	122.0	5.0	124.2	7.9	4.0
6-7	133.0	146.0	132.0	143.0	130.0	152.0	135.0	142.0	130.0	150.0	10.0	139.3	8.3	2.8	141.0	122.0	120.0	128.0	128.0	5.0	127.8	8.2	4.1
7-8	133.0	150.0	138.0	145.0	134.0	156.0	138.0	147.0	136.0	151.0	10.0	142.8	8.0	2.7	143.0	119.0	125.0	131.0	139.0	5.0	131.4	9.8	4.9
8-9	136.0	156.0	137.0	148.0	137.0	160.0	140.0	153.0	138.0	154.0	10.0	145.9	9.3	3.1	146.0	127.0	128.0	136.0	139.0	5.0	135.2	7.9	4.0
9-10	140.0	157.0	144.0	150.0	138.0	165.0	142.0	158.0	141.0	155.0	10.0	149.0	9.3	3.1	148.0	119.0	128.0	139.0	141.0	5.0	135.0	11.5	5.7
10-11	141.0	161.0	142.0	155.0	141.0	168.0	144.0	164.0	153.0	154.0	10.0	152.3	10.0	3.3	148.0	124.0	133.0	136.0	148.0	5.0	137.8	10.3	5.2
11-12	145.0	162.0	157.0	154.0	141.0	173.0	144.0	170.0	160.0	158.0	10.0	156.4	10.7	3.6	149.0	120.0	131.0	140.0	150.0	5.0	138.0	12.7	6.3

Stairmaster Ergometer @ 60 steps/min (Post-training)
Heart Rate (bpm)

	WTTRAIN GROUP														CONTROL GROUP								
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	91.0	119.0	91.0	106.0	99.0	95.0	99.0	108.0	74.0	112.0	10.0	99.4	12.8	4.3	90.0	94.0	82.0	91.0	101.0	5.0	91.6	6.9	3.4
1-2	97.0	121.0	101.0	112.0	114.0	105.0	110.0	111.0	80.0	123.0	10.0	107.4	12.6	4.2	103.0	107.0	90.0	101.0	111.0	5.0	102.4	7.9	4.0
2-3	104.0	125.0	112.0	124.0	132.0	114.0	115.0	121.0	100.0	130.0	10.0	117.7	10.6	3.5	108.0	115.0	96.0	109.0	114.0	5.0	108.4	7.6	3.8
3-4	114.0	131.0	119.0	129.0	136.0	121.0	124.0	124.0	113.0	135.0	10.0	124.6	8.1	2.7	114.0	129.0	106.0	120.0	114.0	5.0	116.6	8.5	4.3
4-5	117.0	139.0	127.0	132.0	147.0	130.0	129.0	132.0	122.0	142.0	10.0	131.7	9.0	3.0	119.0	134.0	111.0	124.0	125.0	5.0	122.6	8.4	4.2
5-6	122.0	139.0	131.0	143.0	151.0	138.0	131.0	132.0	124.0	145.0	10.0	135.6	9.3	3.1	127.0	140.0	119.0	131.0	129.0	5.0	129.2	7.6	3.8
6-7	123.0	146.0	131.0	143.0	157.0	142.0	136.0	136.0	132.0	146.0	10.0	139.2	9.6	3.2	126.0	140.0	121.0	136.0	132.0	5.0	131.0	7.6	3.8
7-8	126.0	149.0	137.0	144.0	158.0	148.0	136.0	138.0	140.0	150.0	10.0	142.6	9.1	3.0	134.0	144.0	124.0	136.0	138.0	5.0	135.2	7.3	3.6
8-9	128.0	150.0	139.0	147.0	158.0	152.0	138.0	143.0	142.0	150.0	10.0	144.7	8.6	2.9	134.0	144.0	127.0	141.0	146.0	5.0	138.4	7.8	3.9
9-10	129.0	154.0	140.0	148.0	159.0	158.0	139.0	145.0	143.0	154.0	10.0	146.9	9.6	3.2	135.0	146.0	129.0	141.0	147.0	5.0	139.6	7.6	3.8
10-11	133.0	154.0	142.0	152.0	166.0	166.0	141.0	146.0	161.0	155.0	10.0	151.6	11.1	3.7	137.0	143.0	130.0	143.0	155.0	5.0	141.6	9.2	4.6
11-12	130.0	158.0	143.0	152.0	167.0	170.0	144.0	150.0	169.0	154.0	10.0	153.7	12.8	4.3	139.0	144.0	133.0	148.0	161.0	5.0	145.0	10.6	5.3

MAIN EFFECT GROUP - p <0.021

Stairmaster Ergometer @ 60 steps/min (Pre-training)
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP								
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	17.6	24.5	16.6	21.7	14.5	21.6	14.7	18.6	17.8	28.2	10.0	19.6	4.4	1.5	22.4	15.6	14.5	17.5	19.7	5.0	18.0	3.2	1.6
1-2	18.7	25.9	18.0	22.2	17.8	24.3	15.7	22.0	20.8	24.9	10.0	21.0	3.4	1.1	25.5	19.0	15.2	20.9	24.2	5.0	21.0	4.1	2.1
2-3	21.0	28.6	21.2	25.9	19.0	27.2	18.3	23.7	26.4	28.8	10.0	24.0	3.9	1.3	30.1	22.1	17.1	24.4	25.8	5.0	23.9	4.8	2.4
3-4	22.2	32.1	22.7	29.7	24.0	31.0	21.0	26.2	30.2	31.2	10.0	27.0	4.3	1.4	32.9	25.4	20.0	28.4	28.8	5.0	27.1	4.8	2.4
4-5	25.2	34.5	23.4	32.3	25.4	34.2	25.6	29.8	34.1	35.0	10.0	30.0	4.6	1.5	37.1	28.5	22.5	31.7	32.4	5.0	30.4	5.4	2.7
5-6	27.6	38.4	26.6	33.6	26.1	39.7	26.3	32.1	35.6	38.1	10.0	32.4	5.4	1.8	37.8	28.9	26.6	34.0	35.2	5.0	32.5	4.6	2.3
6-7	29.0	39.7	28.3	36.2	28.0	41.3	28.4	34.7	37.6	40.1	10.0	34.3	5.4	1.8	40.9	30.1	26.8	33.8	37.7	5.0	33.9	5.7	2.8
7-8	29.7	42.5	29.7	37.8	29.6	42.8	29.5	37.4	40.2	44.0	10.0	36.3	6.1	2.0	41.7	30.6	29.5	35.3	41.6	5.0	35.8	5.8	2.9
8-9	30.3	43.4	29.7	39.1	30.1	45.4	30.7	40.0	42.5	43.7	10.0	37.5	6.5	2.2	43.4	33.0	32.1	37.2	43.7	5.0	37.9	5.5	2.8
9-10	32.0	44.5	31.6	39.6	30.1	47.6	31.8	42.7	43.3	45.3	10.0	38.9	6.8	2.3	43.5	31.5	32.5	38.2	44.5	5.0	38.0	6.1	3.0
10-11	32.8	45.9	30.2	41.1	31.4	46.9	31.6	45.3	49.4	46.2	10.0	40.1	7.7	2.6	43.5	32.2	34.6	37.1	47.9	5.0	39.1	6.5	3.3
11-12	34.3	45.4	34.1	41.7	32.1	49.9	31.9	48.0	52.3	49.6	10.0	41.9	8.1	2.7	44.3	31.8	35.0	38.8	51.5	5.0	40.3	7.8	3.9

Stairmaster Ergometer @ 60 steps/min (Post-training)
Rate-Pressure Product

	WTTRAIN GROUP														CONTROL GROUP								
FLIGHT	A	B	C	D	E	F	G	H	I	J	N	MEAN	S.D.	SEM	A	B	C	D	E	N	MEAN	S.D.	SEM
0-1	15.1	25.0	16.3	21.2	17.3	19.7	16.3	20.1	17.0	23.4	10.0	19.1	3.3	1.1	18.4	24.3	14.4	16.7	25.0	5.0	19.8	4.7	2.4
1-2	16.9	25.1	18.2	23.0	19.7	23.0	18.7	21.9	19.2	24.3	10.0	21.0	2.8	0.9	24.7	27.1	15.7	20.3	30.3	5.0	23.6	5.7	2.9
2-3	18.5	27.2	22.3	27.3	25.0	25.2	20.7	24.9	25.7	27.4	10.0	24.4	3.0	1.0	27.1	31.5	17.5	24.7	31.9	5.0	26.5	5.9	3.0
3-4	22.3	29.4	24.3	30.7	28.1	29.6	23.6	27.7	30.6	30.0	10.0	27.6	3.1	1.0	30.4	36.6	20.7	29.4	32.6	5.0	30.0	5.9	2.9
4-5	23.8	32.3	27.5	32.7	30.2	33.0	26.5	29.8	35.4	33.0	10.0	30.4	3.6	1.2	31.7	40.9	23.2	31.7	40.0	5.0	33.5	7.2	3.6
5-6	24.7	35.2	29.0	35.6	32.6	36.5	26.3	32.1	36.0	36.9	10.0	32.5	4.4	1.5	35.9	44.5	25.8	35.7	43.5	5.0	37.1	7.6	3.8
6-7	26.2	37.2	29.8	36.8	33.7	38.7	29.0	33.5	39.7	38.9	10.0	34.4	4.7	1.6	36.6	45.4	28.4	37.8	44.9	5.0	38.6	7.0	3.5
7-8	28.9	39.0	31.6	37.3	34.5	41.1	29.6	35.0	43.5	41.3	10.0	36.2	5.1	1.7	40.8	47.3	29.5	37.6	46.9	5.0	40.4	7.4	3.7
8-9	30.1	39.9	31.5	37.7	34.9	42.3	30.2	36.2	44.6	44.1	10.0	37.1	5.5	1.8	41.5	48.3	31.6	38.9	49.7	5.0	42.0	7.4	3.7
9-10	30.1	42.0	31.7	38.8	35.6	44.8	30.7	39.1	45.2	47.3	10.0	38.5	6.3	2.1	41.9	48.6	33.4	40.5	50.0	5.0	42.9	6.7	3.3
10-11	31.6	42.0	33.0	40.1	38.1	46.8	31.9	39.7	52.3	47.3	10.0	40.3	7.0	2.3	42.9	48.3	32.8	40.5	52.8	5.0	43.5	7.6	3.8
11-12	30.6	42.9	32.9	40.7	37.3	48.7	33.0	40.4	55.7	47.6	10.0	41.0	8.0	2.7	43.9	48.1	35.3	43.0	55.0	5.0	45.0	7.2	3.6