HUMAN CARDIOVASCULAR RESPONSES TO ARTIFICIAL GRAVITY TRAINING

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ABSTRACT OF DISSERTATION

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TO
ARTIFICIAL GRAVITY TRAINING

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A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
Graduate School
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By
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Human cardiovascular adaptations to microgravity include decreased plasma volume, exercise capacity, baroreflex function as well as decreased orthostatic tolerance upon return to a gravity environment. Several countermeasures have been proposed and tested, although currently none have been developed to prevent post-spaceflight orthostatic intolerance (OI). Artificial gravity (AG) generated by short-radius centrifugation (SRC) has been proposed as a countermeasure to OI as well as other cardiovascular alterations. Methods: Fifteen men and fourteen women underwent three weeks of daily (5 days a week) exposure to intermittent (1.0 to 2.5 G_z) artificial gravity on a 1.9m human powered centrifuge (HPC) at the NASA Ames Research Center. Half the subjects exercised (active) to power the HPC while half rode passively (passive). A combination head-up tilt (HUT) and lower body negative pressure (LBNP) test was used to determine orthostatic tolerance before and after training. Oscillatory LBNP (OLBNP) was used at seven frequencies (0.01 to 0.15 Hz) for two minutes each to assess the dynamic responses of the cardiovascular system to orthostatic stress, before and after AG training. Results: Training improved overall tolerance in the group of subjects by 13% ($p<0.05$); men were more tolerant than were women ($p<0.05$); and active subjects were more improved than passive subjects ($p<0.05$). Mechanisms of improvement appear to be through decreased total peripheral resistance (TPR) and increased stroke volume after training, and increased responsiveness of TPR to fluid shifts (faster changes in TPR to changes in calf

circumference [CC] and OLBNP after training). There was no change in spontaneous baroreflex sensitivity (BRS, calculated by sequence method) or number of sequences per number of heart beats (NNS), although BRS analysis did indicate that stimulation to the cardiac baroreceptors during 1.0 G_z and 2.5 G_z centrifugation was no different than supine control and 70° HUT, respectively. Taken together, these results suggest that AG training improved tolerance through training of local mechanisms in the peripheral vasculature, or extrinsic control of peripheral vascular resistance, rather than through changes of autonomic control of heart rate.

KEYWORDS: Artificial Gravity, Spaceflight Countermeasures, Cardiovascular Regulation, Gender Differences, Acceleration Training

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Michael B. Stenger

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I would like to dedicate this work to my wife, Nydia, who has been by my side every step of the way along this incredible journey. Your support has been invaluable and I would not be the man that I am today without you in my life.

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Chapter 1: Introduction

Space, and Earth's position in the cosmos has always been a topic of interest (and dispute) throughout mankind's history. In *On the Heavens*, Aristotle (384-322 B.C.) described the earth as being the center of the universe, with all of the other heavenly bodies revolving around us in circular orbits (67). This geocentric theory was modified by Ptolemy (87-150 A.D.) and accepted as fact until the early 16th century when Nicolaus Copernicus came up with a heliocentric model in which the earth revolves around the sun (68). Nearly 100 years later, Galileo Galilei used telescopes to observe that not all celestial bodies revolve around the earth, and he accepted that the geocentric theory could not be correct (63). One of Galileo's contemporaries, Johannes Kepler corroborated his findings, determining that the earth and the other planets revolved around the sun in an elliptical orbit. Despite the overwhelming scientific evidence, this was still an issue of much contention. The dispute was finally laid to rest in 1687 with the publication of Sir Isaac Newton's *Philosophiae Naturalis Principia Mathematica*, in which he theorized the movement of bodies in space, and developed mathematical equations for proof (67). After millennia of thinking that the earth was at the center of the galaxy, mankind has made giant leaps in its knowledge and understanding of the earth and galaxy.

Only half a century ago man developed the technology to finally travel into space. Led by the Russian cosmonaut Yuri Gagarian in April of 1961, and followed by American Alan Shepard only a month later, humans broke the bonds of Earth and entered space for the first time. Since then, humans have set foot on the moon, lived in space stations orbiting the planet and made hundreds of trips into space. Even more astounding, private civilians developed SpaceShipOne in 2004, the first civilian vehicle to reach space (35). With the growing projected number of humans in space (including people with varied physiological makeup and fitness), and the desire to explore farther away from Earth, the issue of human safety and space travel needs continued investigation.

While some dangers of space travel are obvious--space radiation, extreme temperatures and vacuum, lift-off, re-entry and landing, to name a few (109, 149); there are a host of physiological adaptations that the body undergoes in a microgravity environment that are potentially harmful. Exposure to microgravity can cause muscle atrophy (36, 80, 87, 123), bone demineralization (69, 70, 80, 137) (kidney stones due to high calcium filtration secondary to demineralization), decreased immune function (6, 17, 109, 113), neurovestibular defects (85, 100, 130) and impaired cardiovascular function (7, 10, 21, 37, 40, 46-48, 62, 90, 92, 104, 109, 131, 137, 142, 149); i.e., decreased plasma volume and red cell count, decreased autonomic function, cardiac arrhythmias and decreased orthostatic tolerance upon return to a gravity environment. These physiological adaptations can decrease astronaut work performance and efficiency as well as endanger crew safety. Some countermeasures have been developed to, if not prevent, at least to ameliorate several of these microgravity-induced impairments. For example, exercise is used to maintain work capacity, and especially when combined with lower body negative pressure, mitigate muscle atrophy and bone loss (22, 33, 97). Ingestion of salt tablets and fluid retaining drugs such as fludrocortisone have been used to restore plasma volume (110, 125) before re-entry. Pressurized G-suits are routinely used to help maintain orthostatic tolerance upon landing, but this benefit goes away once the astronaut takes the suit off. As yet there is no operationally-accepted countermeasure to prevent the orthostatic intolerance and many other physiological changes associated with spaceflight deconditioning.

Objective

There has been discussion that some form of artificial gravity would help to prevent many of the detrimental effects of spaceflight (11, 13, 14, 16, 34, 76, 79, 83, 84, 128, 145, 146). The use of a short radius centrifuge (radius of approximately body length) to produce centripetal forces along the spinal axis is of growing interest to NASA. The purpose of the research described in this document is to determine if artificial gravity generated by a short-radius centrifuge (SRC) affects cardiovascular function of normal, ambulatory human subjects. To this extent, measurements were made of the static orthostatic responses (to a combination of head-up tilt and lower body negative pressure) as well as dynamic responses (to 7 different lower body negative pressure input frequencies ranging from 0.01 Hz to 0.15 Hz) in 15 men and 14 women before and after

3 weeks of daily, intermittent exposure to artificial gravity via short-radius centrifugation. The hypothesis for this study is that 3 weeks of training will improve orthostatic tolerance. The primary goal of this research is to determine the mechanisms associated with the hypothesized improvement.

Chapter 2: Background

Physiological Responses to Orthostatic Stress

Standing up from a supine position in a gravity field (i.e. on earth) imposes a substantial challenge to the human cardiovascular system. Due to the increase in hydrostatic pressure gradient acting along the length of the body, venous volume increases by approximately 500 mL (105). This redistribution of fluid from the central circulation is immediately detected by baroreceptors (pressure) and, in time, by volume (osmolarity) receptors activating reflex responses to increase heart rate, contractility and vascular resistance as well as to maintain blood volume. This response is described in detail below.

The carotid, aortic and cardiopulmonary baroreceptors are sensitive stretch receptors, which can detect increases or decreases in arterial pressure. The afferent fibers from carotid baroreceptors transmit signals to the nucleus tractus solitarius (NTS) via the glossopharyngeal nerve, while afferents from the aortic arch and pulmonary system transmit through the Xth cranial nerve, the vagus (89). Most cardiac afferents synapse at the NTS, where information is assimilated and parasympathetic outflow is relayed to the nucleus ambiguus (NA, location of vagal motor neurons) and sympathetic outflow is relayed to the caudal ventrolateral medulla (CVLM). Sympathetic neurons in the spinal cord are tonically excited by input from the rostral ventrolateral medulla (RVLM). In turn, RVLM outflow is mediated by the CVLM via the inhibitory neurotransmitter γ-aminobutyric acid (GABA) (89). Depending on the afferent input to the NTS, sympathetic outflow from the RVLM can be modulated through the CVLM, and there is evidence of a direct inhibitory pathway to the spinal motor neurons through the raphe nuclei (89).

At the level of the heart, the right vagus synapses at the sinoatrial (SA) node, which is the pacemaker node. The left vagus synapses near the atrioventricular (AV) node which controls the conduction velocity to the ventricles. The parasympathetic neurotransmitter is acetylcholine (ACh) which binds to muscarinic receptors in these pacemaker cells. Acetylcholine slows heart rate through two G-protein second messenger systems; one is an inhibitory G-protein which reduces the slope of the depolarizing current in the pacemaker cells by inhibiting cAMP modulation (via reduced adenylate cyclase activity) of depolarizing sodium influx and the second is a stimulatory G-protein which hyperpolarizes pacemaker cells by increasing potassium efflux. Both of these result in a reduction of heart rate.

The pre-ganglionic sympathetic neurons to the heart synapse in the thoracic spinal column, T1 to T5 (89). The post-ganglionic neurons innervate the whole heart (i.e., myocardial cells of the ventricles, atria and electrical system) as opposed to the nodal innervation of parasympathetic neurons. Norepinephrine (NOR) is the sympathetic neurotransmitter, which binds to β_1 receptors in the heart. Its chronotropic effect is opposite to that of ACh in that β_1 receptors stimulate adenylate cyclase, which increases the conversion of ATP to cAMP, leading to an increase in sodium influx. This increased sodium current increases the slope of the depolarizing current, which increases heart rate. Norepinephrine also increases chronotropism through increased AV conduction velocity and decreased myocyte action potential duration via early repolarization (89). Sympathetic-stimulated increase in cAMP also has an inotropic effect; cAMP phosphorylates protein kinase A (PKA), which increases calcium influx into the myocytes through calcium channels. PKA also phosphorylates phospholamban, which causes the sarcoplasmic reticulum (SR) to remove free calcium from within the cell faster. Over the course of a few heart beats, this increases SR calcium (mainly due to SR storage of extracellular calcium), which leads to stronger contractions. It is clear that sympathetic activity has a longer biochemical second messenger chain to act through, and this partially explains why it is slower to respond than the parasympathetic system, which can respond within a heart beat (5). Epinephrine, released from the adrenal medulla, has an effect very similar to norepinephrine at the cardiac level.

At the arteriolar and venule level, sympathetic neural activity controls vascular resistance through contraction and relaxation of vascular smooth muscle (VSM) cells. The post-ganglionic sympathetic neurotransmitter, norepinephrine, binds to α-adrenoreceptors on the surface of VSM cells. These receptors act through two G-proteins to cause muscle contraction; 1) directly increasing calcium channel influx of calcium and 2) activation of phospholipase C which catalyzes the conversion of phosphatidyl inositol bisphosphate (PIP_2) to inositol triphosphate (IP_3) and diacyl glycerol (DAG). IP_3 stimulates the release of calcium from intracellular SR, which along with extracellular calcium triggers contraction. DAG activates protein kinase C which helps to sustain longer contractions (89).

Unlike its action at the heart, epinephrine can have an effect opposite to norepinephrine when acting on peripheral blood vessels. Epinephrine binds to β_2 receptors as well as α-adrenoreceptors in the vasculature. In areas of high β_2 density, such as in skeletal muscle and the liver, epinephrine can cause vasodilation (89). Vasodilation in VSM is a G-protein coupled process. β_2-adrenoreceptor activation causes an adenylate cyclase-mediated conversion of ATP to cAMP, which in turn activates protein kinase A. This phosphorylates the activation of Ca-ATPases in the SR and the cell wall, reducing intracellular calcium levels and thereby causing vasodilation. Other vasodilators act through the cAMP pathway, including adenosine, histamine, vasoactive intestinal polypeptide (VIP) and calcitonin-gene related peptide (CGRP). Another powerful vasodilator, nitric oxide (NO), acts in a different manner. Rather than being coupled to a G-protein complex, NO diffuses through the VSM membrane and activates protein kinase G, which is thought to act in the same fashion as protein kinase A (89).

Concurrent with the neural response, is the endocrine response. Sympathetic outflow releases epinephrine and norepinephrine from the adrenal medulla gland. The action of these two catecholamines is described above. Renal sympathetic nerve activity stimulates the release of renin which converts angiotensinogen to angiotensin I. Angiotensin I is eventually converted to Angiotensin II (AII) in the lungs. Angiotensin II plays two key roles in cardiovascular control; it is a potent vasoconstrictor, and it stimulates aldosterone secretion, which stimulates sodium and water retention in the kidneys.

In addition to stimulating the baroreceptor response, standing can eventually trigger osmolarity receptors, located in the hypothalamus, which mediate the release of vasopressin. Vasopressin, also known as anti-diuretic hormone, stimulates the kidneys to retain water. Vasopressin can also act as a vasoconstrictor in most tissues, except for the cerebral and coronary vessels where it actually has a vasodilatory effect (89). This is an appropriate response, as it redistributes blood to the heart and brain in cases of hypovolemia.

Considering again a person standing in a gravity environment, a decrease in blood pressure is countered by parasympathetic withdrawal and sympathetic activation. Reflex activity then leads to a faster and stronger heart beat, coupled with an increase in vascular (in both arterioles and venules) resistance, and hormonal activation to maintain plasma volume. This total reflex helps to maintain perfusion to the brain. It is important to note that the most important regulator of blood pressure is the vascular resistance response (105). Increasing vascular resistance results in decreased filtration at the capillary level which can lead to increased venous return to the heart. If vascular resistance did not increase, increasing heart rate would not increase cardiac output as stroke volume would continue to fall due to the lack of filling pressure.

In humans, the splanchnic region is the most compliant, and therefore capable of retaining the largest amount of blood volume. The greatest percentage of total body fluid conductance is in the splanchnic region (25%) with the renal system and skeletal muscle each containing about 20% of the total conductance (105). It is these regions, therefore, that vasoconstrictor activity is most important in order to shift fluid to the upper thorax and brain. In the legs, contraction of muscles upon standing helps to increase venous return by compressing the veins; one way valves in the veins allow blood to travel in one direction only—towards the heart.

In summary, the reflex response to standing in a 1 Gz environment is increasing heart rate and cardiac contractility, vascular resistance and blood volume, all in an attempt to maintain cerebral perfusion. If cerebral perfusion is compromised, as is often the case in astronauts returning from space, syncope, or fainting, can occur.

Cardiovascular Deconditioning in Microgravity

Due to the limited nature of data from actual spaceflights, there are some conflicting theories on the exact mechanisms of cardiovascular adaptation to microgravity. In general, the absence of Earth's gravity gradient shifts fluid from the peripheral vasculature to the upper thorax (19, 24, 64, 96, 122). One would expect volume contraction via diuresis, but reduced fluid ingestion, and in some cases, emesis from space motion sickness, are major contributors to reduced volume (134). Loss of total fluid volume, as well as interstitial filtration (131), causes plasma volume contraction and lowering of central venous pressure (21, 30, 31).

This loss of plasma volume is associated with a 10 – 20% decrease in stroke volume (134), and surprisingly, a decrease in resting heart rate (48, 62) which appears to be vagally dominated (62). The decrease in heart rate is surprising, especially in light of increased total sympathetic outflow (40) which increases calf vascular resistance(133) and in the long term, a reduction in leg volume (96, 122). Another cause for reduction in leg volume is muscle atrophy (36, 86, 123), which is thought to increase overall leg compliance, a key player in post-spaceflight hypotension (134). The next section describes in detail the altered physiological response to orthostatic stress after extended exposure to microgravity.

Physiological Responses to Standing after Deconditioning

Due to the adaptations to microgravity, many astronauts develop presyncopal symptoms upon returning to Earth. The deleterious effects of spaceflight on orthostatic tolerance depend on the duration of microgravity exposure and the type of orthostatic test used. Buckey et al. reported 9 out of 14 astronauts were unable to withstand a 10 minute stand test after 9-14 days in space (7). Meck et al. reported that 4 of 5 astronauts become syncopal after long duration spaceflight (129 – 190 days) while only 1 out of these same 5 became syncopal during a short duration spaceflight (91); both tests were 10 minute stand tests. In two separate studies, Meck et al. report post-flight orthostatic intolerance to the 10 minute stand test in 4 out of 16 and 10 out of 23 astronauts (47, 92). Levine et al. studied 6 astronauts after 16 days in space, and reported no cases of syncope; however, it is important to note that they used a 60^{o} passive head-up tilt with one leg bearing the full load of a subject's weight (the second leg was elevated for microneurography measurements), which could stimulate a stronger reflex response than passive stand tests, in which astronauts are instructed to relax leg muscles (90).

In all cases, post-flight orthostatic testing is characterized by a greater increase in heart rate and decrease in stroke volume (7, 47, 90-92, 142). Although heart rate is elevated after spaceflight, there is evidence that this baroreflex mediated response is altered adversely by spaceflight (7, 46, 48). At the same time, however, sympathetic outflow is intact and responds appropriately (40, 50, 90, 142) to the orthostatic stress. Even though sympathetic outflow is intact, it is possible that it is not sufficient to maintain peripheral vascular resistance. There is evidence of increased norepinephrine release without concomitant increase in vascular tone (142) suggesting a decrease in α-adrenoreceptor (92, 142) or increased β-adrenoreceptor responsiveness (104).

Vascular resistance has been determined to be one of the key factors in distinguishing "finishers" (those able to withstand the 10 minute stand test) from "non-finishers" (those unable to withstand the 10 minute stand test). Several researchers have noted that "finishers" tend to have higher total peripheral resistance than "non-finishers" (7, 91, 92, 136) during the stand test after spaceflight. Moreover, recent research shows that application of midodrine, an α_1 agonist, increased vascular resistance and improved orthostatic tolerance in a previously orthostatically-intolerant astronaut — lending strength to the role of vascular resistance in maintaining orthostatic tolerance after spaceflight (101).

Gender Differences in Physiological Responses to Orthostatic Stress

There are several well documented differences between male and female human responses to orthostatic stress, most notably that men are more tolerant than women (23, 43, 49, 93, 136, 139). There are contributing factors to the female predilection to faint that have been documented, both in baseline control values and in the response to orthostatic stress (i.e. lower body negative pressure, head-up tilt or stand test). Men tend to have higher resting blood pressure (49, 54, 55, 93, 95, 112, 136) as well as increased pressure in response to orthostatic stress (23, 55, 111, 136); women tend to have higher resting heart rate (93, 95, 112, 136) and increased heart rate response to orthostatic stress (45, 93, 111). While baseline levels of vascular resistance appear to be the same, several reports indicated that men have a higher vasoconstrictive response to hypotensive challenges than do women (45, 55, 93, 136) while others report no differences in the vasoconstrictive response between genders (23, 49, 111).

Reports of increased norepinephrine levels during hypotensive stress would support the idea of increased vasoconstrictor response in men (23, 136) while still others report no gender differences in circulating norepinephrine levels during orthostatic stress (49, 53). However, there is some evidence for differences in the vascular responsiveness to circulating levels of catecholamines. One report indicates strong vasoconstrictive responses to α-adrenergic agonists phenylephrine and clonidine in men, while showing no response in women (44). The same report shows that men also have greater responsiveness than women to the β-adrenergic agonist isoproterenol. One of the contributing factors to decreased orthostatic tolerance in females is probably their hypoadrenergic response to stress (44, 92, 136), which may be confounded by the vasodilatory effect of circulating estrogen (129, 143, 144). Additionally, women tend to pool more blood in the splanchnic area, which could also adversely affect orthostatic tolerance (93, 139).

Previous Countermeasures

One of the most dangerous effects of cardiovascular deconditioning, especially in the context of space shuttle landing or emergency egress in a gravity environment, is orthostatic intolerance. There have been several countermeasures developed that have attempted to prevent this. One successful countermeasure is the use of G-suits, which work by applying positive pressure to the legs and lower thorax, thereby aiding in venous return and maintaining cerebral perfusion (32). However, these effects are only transient, and disappear once the G-suit is removed after landing.

One of the underlying reasons for post-flight orthostatic intolerance is hypovolemia, and various attempts have been made to restore plasma volume. Ingestion of salt water (8 grams of NaCl with 960 mL of water) before re-entry has been shown to restore plasma volume and prevent orthostatic hypotension in a flight of less than 7 days (9). However, the benefits of saline loading disappear during long flights (141). There have been mixed results to saline loading in simulated microgravity (6^{o} head-down bed rest) studies. Using the same protocol that U.S. astronauts use (8, 1 gram NaCl tables in 960 mL of water), Vernikos et al determined that this method was insufficient to restore plasma volume (and orthostatic tolerance) to pre-bed rest levels (125). However, by basing saline ingestion on body weight instead of limiting it to the standard 960 mL, Waters et al were able to restore plasma volume and prevent orthostatic intolerance in a similar simulated microgravity study (135). It is important to note that, even though studies in simulated microgravity are many times similar to actual results from a microgravity environment, results are not always similar. The use of fludrocortisone has been shown to prevent plasma volume loss (and hence maintain orthostatic tolerance) in a simulated microgravity study (125), but the same protocol used in an actual spaceflight environment did not improve orthostatic intolerance (110).

It is likely that plasma volume restoration alone is not sufficient to prevent spaceflight-induced orthostatic intolerance; some form of stimulation or stress to the cardiovascular system is likely needed to attenuate deconditioning in microgravity. Lower body negative pressure (LBNP) has been proposed as a means of generating a head-to-foot force (65) and is well known for displacing fluid to the lower body and thereby stimulating the cardiovascular system (25, 60, 61, 65). Application of LBNP has been shown to be effective in spaceflight and ground based studies to prevent orthostatic hypotension (3, 42, 59-61, 71, 119). However, the duration and frequency of required LBNP stimulation makes it unattractive during spaceflight, where time is already limited (20, 84).

Another countermeasure that is currently being used, but it not completely effective in preventing post-flight hypotension, is aerobic exercise (15, 22, 33, 58, 107). Astronauts exercise either on a stationary bicycle or treadmill, and can perform isokinetic training with spring resistance devices (33). This method of moderate intensity exercise for long durations is effective in maintaining work capacity, but not in maintaining orthostatic tolerance. When studied in ground based simulations of microgravity, an acute bout of maximal exercise one day before the end of the study was shown to be effective in restoring plasma volume and orthostatic tolerance to pre-bed rest levels (27, 29, 33, 38, 39). Although this countermeasure did not elucidate greater tolerance than control subjects after spaceflight, it did increase cardiac output and stroke volume, and shows merit for future use (94).

Perhaps the most logical countermeasure to deconditioning in a microgravity environment is to use an artificial gravity source to stimulate the cardiovascular system. Based largely on the relatively small payload capabilities of current space transports, a short radius, or short arm centrifuge (SRC) has been suggested to provide artificial gravity in space (11, 12, 14, 66, 75, 76, 132, 145). The idea of short arm centrifugation is not a new one; in 1966, White et al showed that periodic centrifugation from 1 G_z to 4 G_z for 20 minutes a day, 4 times a day during 41 days of bed rest prevented the expected orthostatic intolerance after bed rest (140). In the same year, Piemme et al determined that human tolerance on a 4 foot, 9 inch centrifuge ranged from a couple hours at 4 Gz to several minutes at 7 Gz (99).

One of the unknowns in the field of SRC research is the amount of centrifugation, both duration and magnitude, needed to prevent the detrimental effects of microgravity. Hastreiter and Young determined that 1.5 Gz (at the feet) was required to simulate calf blood flow changes similar to standing (66). In a head-down bed rest study, 2 hours a day of passive standing was sufficient to prevent post-bed rest hypotension, although 4 hours a day of passive standing was required to maintain plasma volume (124). Two hours of standing also prevented simulated microgravity effects in a rat tail-suspension study (147). In another non-human study, Korolkov et al studied primates during 4 weeks of HDBR (83). They determined that short radius centrifugation was successful in preventing extracellular fluid loss and orthostatic hypotension resulting from bed-rest. More interestingly, they determined that 1.2 G_z, 3 times a week may be more effective than higher G_z levels, 4 to 5 times a week (83).

In a simulated microgravity study, Iwasaki et al determined that 1 hour of exposure to 2 G_z on an SRC was sufficient to prevent the negative effects of 6° head down bed rest (HDBR) on baroreflex function and plasma volume, although this countermeasure alone was not sufficient to maintain exercise capacity (75); however, another study showed that combining acceleration with moderate exercise helped to maintain upright exercise responses (79). Furthermore, Vil-Viliams showed that exercise combined with centrifugation at 0.8, 1.2 and 1.6 G_z was effective in maintaining orthostatic tolerance from 3 to 28 days of head out water immersion (127).

It is generally accepted that some form of artificial gravity will be effective in ameliorating many of the detrimental effects of spaceflight, not only on the cardiovascular system, but most physiological systems. Current research goals are to determine what kind of artificial gravity is necessary; how much is sufficient, and for how long?

Research by Our Laboratory

Based on the current knowledge presented in the literature, our laboratory recognized the advantage of short radius centrifugation as a countermeasure to spaceflight deconditioning. We therefore participated in a study that used a 1.9 meter SRC to document the effects of 3 weeks of acceleration training with, and without, exercise on the cardiovascular response to one hour of 70° head-up tilt (HUT) on normal, ambulatory male volunteers (57, 118). We determined that intermittent acceleration (7 cycles of 2 minutes at 1 G_z followed by 2 minutes at 2.5 G_z) for 3 weeks improved orthostatic tolerance and baroreflex activity (118), both of which are known to be attenuated after spaceflight (46) and bed rest (75).

Rationale

One of the shortcomings of the above study was that a one hour time limit was placed on the orthostatic stress test, and the test was terminated at this point, regardless of outcome. Therefore, we were unable to get an accurate assessment of the effect acceleration training had on orthostatic tolerance, as many subjects withstood the hour-long HUT both before and after the training protocol. Secondly, this study was only performed on men, and thirdly, only the static responses (to a 70° head-up tilt) of training effects on the cardiovascular system were assessed.

The purpose of the present study was to determine cardiovascular responses of ambulatory humans to 3 weeks of intermittent acceleration training (described above) with and without exercise. More specifically, lower body negative pressure was coupled with head-up tilt to bring all subjects to a pre-syncopal endpoint, in order to determine an accurate assessment of artificial gravity training (with and without exercise) on orthostatic stress tolerance time. Secondly, oscillatory lower body negative pressure was used at 7 different frequencies from 0.01 to 0.15 Hz, to assess the dynamic response of the cardiovascular system before and after artificial gravity training. Thirdly, 15 men and 14 women were studied in order to elucidate any gender differences in these cardiovascular responses before and after artificial gravity training. Specifically the present study was designed to discriminate interactions between before/after training, men/women and exercise/non-exercise effects of artificial gravity training.

Chapter 3: Methods

Subjects

Twenty-nine volunteers began this study, 15 male and 14 female. One male subject was removed from the study for failing to comply with study regulations, and one female subject voluntarily withdrew herself. Data from a second female subject was discarded because of excessive pre-ventricular contractions when studied. Results are reported for data from a total of 26 subjects, 14 male and 12 female.

All subjects were normal, healthy volunteers and were screened for cardiovascular health and absence of drug and alcohol use (including tobacco). Men were 32.4 ± 2.6 years old, 180.4 ± 1.4 cm tall and weighed 81.2 ± 2.0 kg. Women were 31.7 ± 1.8 years old, 164.7 ± 4.12 cm tall and weighed 61.45 ± 19.3 kg. Male subjects were randomly assigned to either the active (those who exercised while on the centrifuge) or passive (those who rode passively) group. Female subjects were also randomly assigned to either group, but an effort was made to pair active and passive subjects based on their menstrual cycles. Complete anthropomorphic data for all subjects can be found in Table 1 of the Appendix.

Training Protocol

Artificial gravity training of subjects occurred on the NASA Ames Human Powered Centrifuge (HPC) in building 221A at the Ames Research Center, Moffett Field, California. Subjects trained 5 days a week (Monday thru Friday), for 3 weeks. Subjects were assigned the same time slot everyday, for consistency in training. Experiments with male subjects took place in April/May of 2003, while female subjects were studied in January/February of 2004. An early schematic of the HPC is shown in Figure 3.1. Since the time of this drawing, one of the second seats was modified for a passive rider (ergometer removed and plate fabricated for resting feet, changes can be seen in the photograph in Figure 3.2).

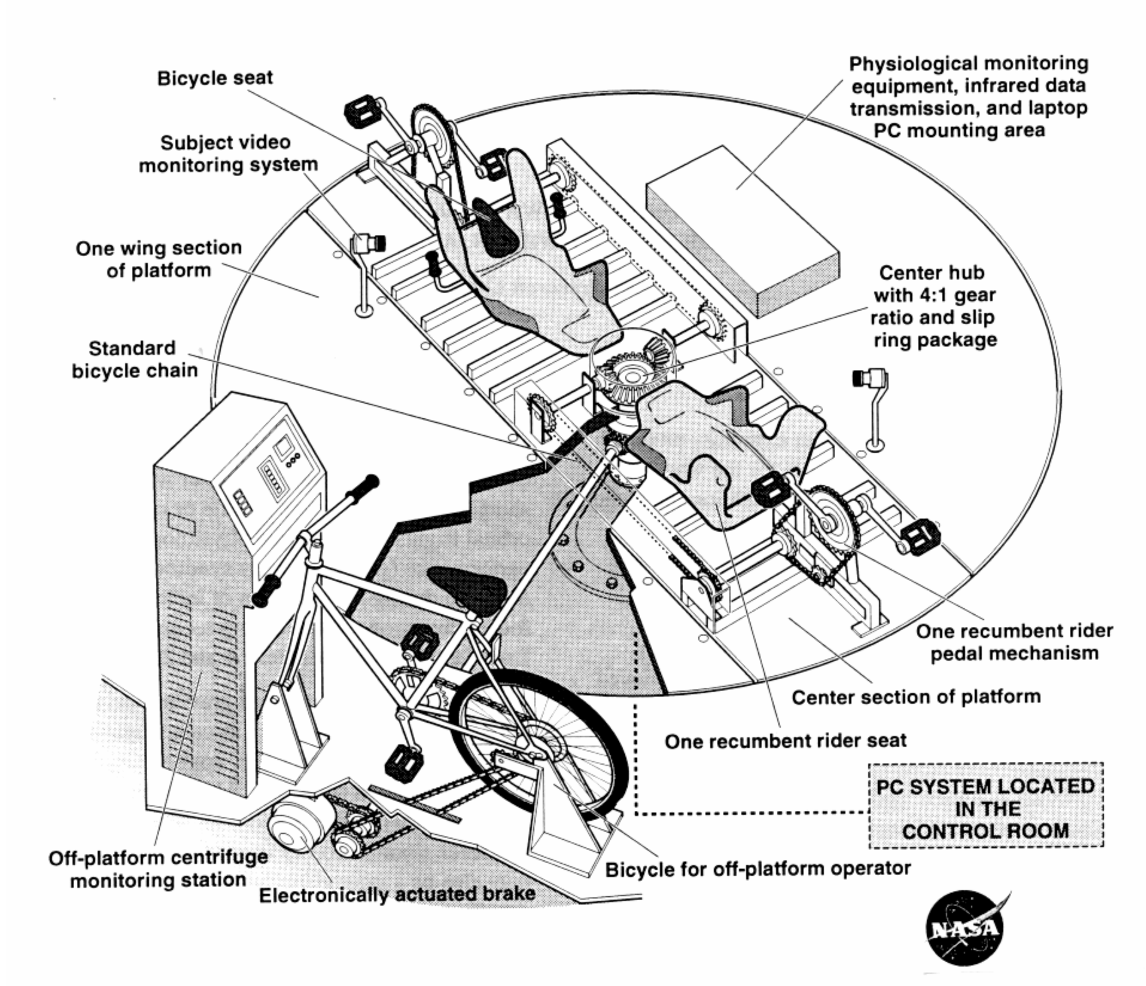

Figure 0.1: Schematic of the human powered centrifuge at the NASA Ames Research Center.

During the week before training began, each subject was introduced to the centrifuge facility. They were allowed to ride the HPC at moderate speeds in order to feel comfortable with the apparatus. They were then shown the tilt table and all of the corresponding instrumentation. Each subject was placed on the table and experienced several tilts and lower body suctions before the study started.

When subjects arrived for a training run, 3 ECG electrodes (3M Red Dot™) were placed on their thorax; one on the left abdomen and two on the upper chest, left and right. ECG was acquired with the Pilot (COLIN Medial). This device can also be used to acquire non-invasive, continuous, tonometric blood pressure, but is very sensitive to motion artifact. Therefore, the active rider was instrumented for continuous blood pressure and heart rate (calculated from the blood pressure waveform) measurements via a plethysmographic device, which is more tolerant of motion artifact (Portapres, TNO). The finger cuff for the Portapres was placed on one of the fingers of the left hand, between the 1st and 2nd knuckles.

Because the passive riders were able to lie still during the training sessions, blood pressure was acquired with the Pilot. The passive rider's left hand was placed in a wrist brace designed to flex the wrist in order to expose the radial artery. The tonometric sensor was then placed approximately over the artery in order for the instrument to make autonomic adjustments to obtain optimal signals. Acceptable signals were then verified by the experimenter on both subjects. Analog outputs were passed through slip rings and digitized through a National Instruments board at 200 Hz. Data acquisition was controlled by a program written by NASA Ames personnel in Labview on a Pentium III class computer.

Based on subject's heights, the seats were placed in such a fashion that the active rider could pedal comfortable, and the passive rider could easily rest his feet flat against the rest plate. Both subjects had their legs bent and thighs elevated, Figure 3.2. Sandbags of various weights were also used to balance out any difference in subject weight. Blindfolds and headsets were secured on the subject's heads and an alarm switch was placed in their right hands to alert investigators in the event of an emergency.

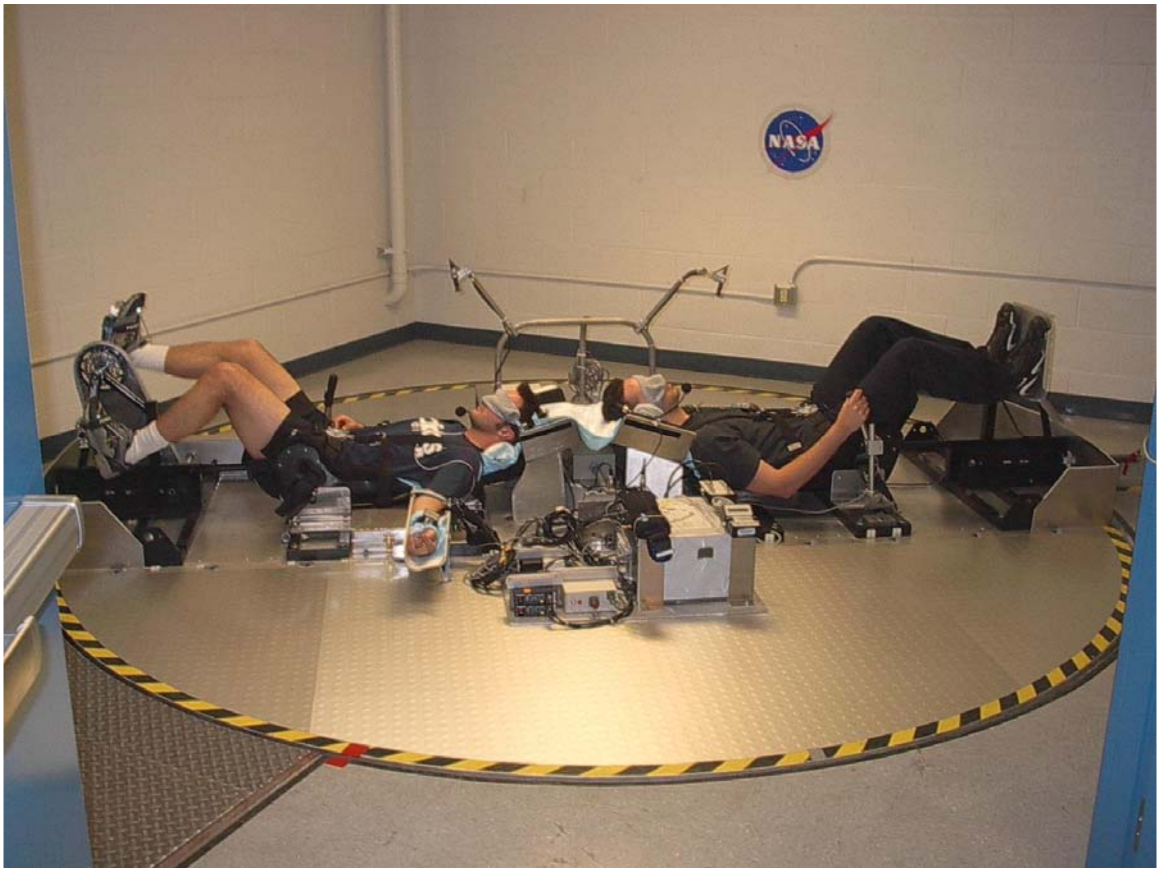

Figure 0.2: Photograph of 2 subjects prior to a training session. Active subject on the left, passive subject on the right. Personal photo taken with consent from subjects.

For each training run, blood pressure, heart rate and ECG signals were verified and alarm switches and headset communications (brand of head set?) tested for correct operation. The active rider was then instructed to begin pedaling up to a rate of 22 rotations per minute to reach the 1 G_z level at the outer edge of the centrifuge. After seven minutes of 1 G_z, the active rider was then instructed to increase the rate of rotation to 35 rpm (which is equivalent to 2.5 G_z) in ten seconds. After two minutes at 2.5 G_z, the active rider was instructed to pedal backwards as the centrifuge slowed down to 1 G_z. Once the centrifuge reached 1 G_z, the active rider maintained the rate of rotation for another 2 minute period. This cycle of 2 minutes at 2.5 G_z and 2 minutes at 1 G_z was repeated 6 times for a total of 7 periods. If at any time the active subject was unable to maintain the correct Gz level, an off-board operator assisted him/her. A typical acceleration profile with corresponding heart rate and blood pressure values can be seen in Figure 3.3.

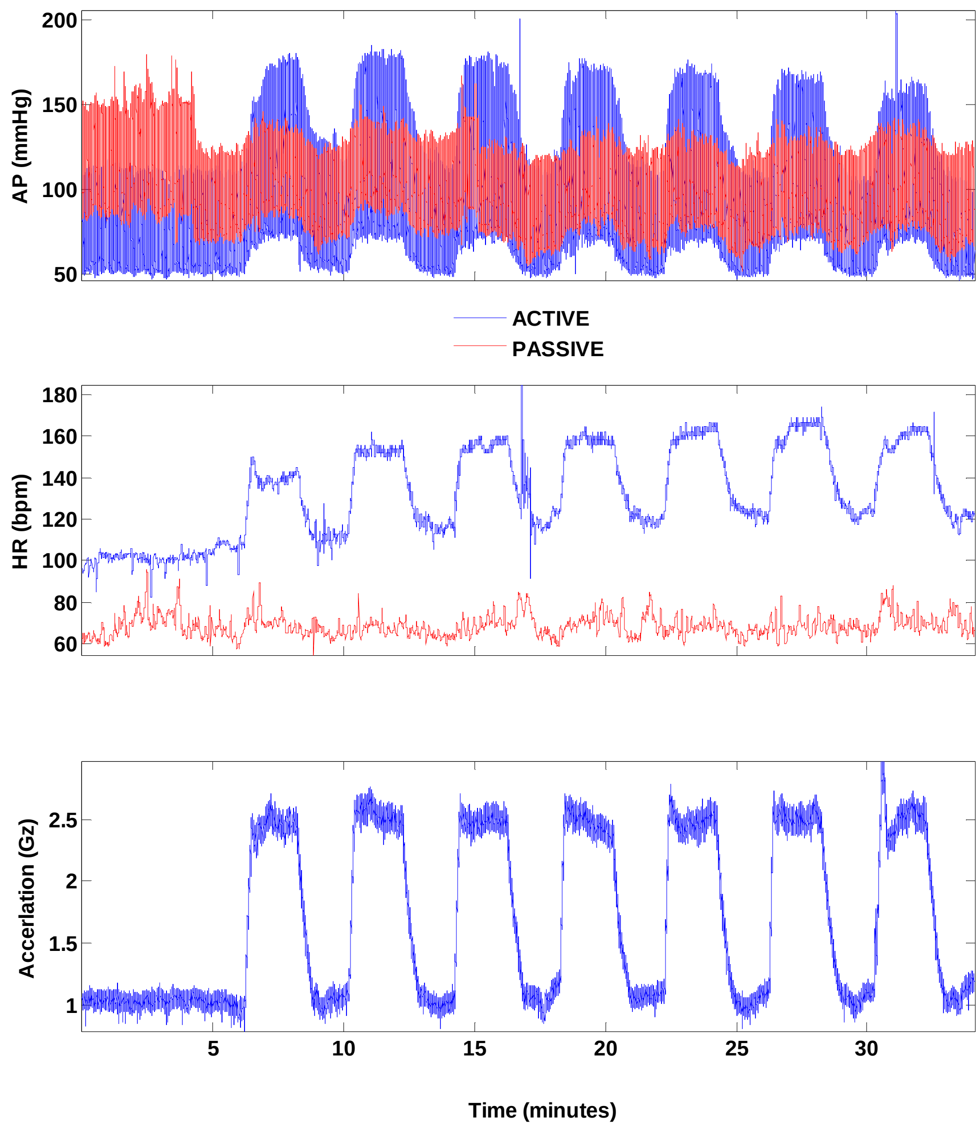

Figure 0.3: Typical AP and HR response of an active (blue) and passive (red) subject during a normal training session.

During these training sessions, communication was maintained between the subjects and the person monitoring their vital signs (blood pressure and heart rate) to insure subject safety. If the active subject's heart rate ever reached 90% of his/her age adjusted maximum heart rate (220 – age), then the off-board operator was asked to help pedal. In the case of the men, this happened only rarely, and only during the first couple days of training. In the case of the women, this happened quite frequently—especially during the transitions from 1.0 to 2.5 G_z.

After each training session, each subject was de-instrumented and went about their normal daily activities. Subjects were asked to not participate in any vigorous athletic training, although they were encouraged to maintain their already light to moderate exercise lifestyles.

Head-Up Tilt / Lower Body Negative Pressure (HUT/LBNP) Test

In order to assess the efficacy of this training protocol, each subject's response to orthostatic stress was tested within 2 days before, and within 2 days after this 3 week training period. Our provocative test was a combination of 70º head-up tilt with lower body negative pressure (HUT/LBNP). Head-up tilt is a classic orthostatic stimulus, but in healthy individuals it may take several hours for pre-syncopal symptoms to occur. By adding LBNP (protocol discussed below) to this stimulus, we were usually able to reach a pre-syncopal endpoint within 20 minutes. Care was taken to test each subject at the same time of day both before and after training. Ambient air temperature was also controlled to be the same for both tilts (71 ºF ± 2ºF).

Each subject arrived 30 minutes before their scheduled test time in order to place ECG electrodes, intravenous catheter (Quick-Cath, Baxter) and consult with the medical monitor before tilting. Once on the table, the subjects were tilted to supine, then to 70° head-up in order to verify seat comfort. The subjects adjusted as necessary, and when they were comfortable, they were returned to the supine position. A mercury strain gauge (EC-4, Hokansen) was then placed around the subject's left calf to measure changes in calf size. Their left leg was supported by foam blocks under the ankle and thigh to prevent any motion artifact in calf circumference measurements. At his time in the procedure, the LBNP chamber was placed around the subject lower body, below the iliac crest. Subjects were then further instrumented. Continuous blood pressure was measured using a Finapres (Ohmeda) device on one of the three middle fingers of the left hand (generally the ring finger). Laser doppler probes (PF4001, Perimed) were placed on the left palm and forearm for skin perfusion, concentration of moving blood cells, and velocity of blood cells. An arm cuff automated blood pressure measurement system

(UA767, AND Medical) was placed on the upper left arm over the brachial artery for verifying the accuracy of continuous blood pressure measurements made by the Finapres. The subjects left arm was extended out from the body and rested in a plastic tray as shown in Figure 3.4. The left arm was positioned in such a fashion that the finger cuff sensor was at the same hydrostatic level as the heart in both supine and 70º head-up positions. If necessary, a heating pad was placed on the left arm to keep the fingers warm in order to obtain optimal blood pressure signals from the Finapres.

Figure 0.4: Fully instrumented subject on tilt table prior to HUT/LBNP test. Personal photo taken with subject's written consent.

Leads were attached to the 11 ECG electrodes for thoracic impedance measurements (BoMed, Cardiodynamics). Subject's height and weight were entered into the BoMed computer for calculation of stroke volume, cardiac output and end diastolic volume, and all signals for verified for quality.

At this point, an 800cc spirobag was used to calibrate fluctuations in thoracic impedance associated with breathing. The subject's nose was clamped, and the subject was instructed to take 5 even expirations and inhalations into and from the 800cc spirobag. The brachial arterial pressure was taken from the AND device and the CC was balanced to zero before beginning the control period. At this point in the instrumentation period, the subject has been supine on the table for 20 to 30 minutes.

The room was kept quiet, and the subject was asked to remain still and quiet for the entire duration of the study, unless they felt any discomfort or pre-syncopal symptoms. Ten minutes of supine control data were collected. At the end of the 10 minute control period, 23 cc's of blood were drawn (Blood Draw #1) from the intravenous catheter and the brachial cuff blood pressure was acquired. The calf circumference was again balanced, and the subject was tilted to 70° head-up. After five minutes at 70°, the vacuum pumps were turned on and -20 mmHg of vacuum was applied to the LBNP chamber. This was held for 3 minutes, at which point the vacuum was increased to -30 mmHg. Twenty-three cc's of blood were drawn (Blood Draw #2) at the beginning of the -30 mmHg LBNP level. Vacuum was held for 3 minutes again, at which time it was increased another 10 mmHg. This procedure was repeated up to -90 mmHg, or until pre-syncopal conditions developed.

Once pre-syncopal symptoms developed, the vacuum was shut off and the table was brought back to the supine position. Blood draw #3 occurred at 1 minute and 30 seconds after the tilt table was brought down from the 70° head-up position. If any of the subjects had difficulty recovering from the stress-induced pooling, they were brought to a slight head-down position to facilitate venous return. If the subject developed pre-syncopal symptoms before the -30 mmHg LBNP level, blood draw #2 was taken immediately after the table was brought down and blood draw #3 occurred immediately after blood draw #2 in these cases. Data during recovery were acquired for 5 minutes after the table was brought to the supine position. At the end of recovery, the medical monitor questioned the subject to obtain details about their pre-syncopal symptoms. Data acquisition was set to "standby" and the subject was allowed to recovery from the HUT/LBNP test for 15 minutes before the next test (oscillatory lower body negative pressure, OLBNP, see below). During this period the Finapres was turned off to reduce external pressure to the finger and improve subject comfort.

Oscillatory Lower Body Negative Pressure (OLBNP) Test

Fifteen minutes after the end of recovery of the HUT/LBNP test, the Finapres was turned back on for continuous blood pressure measurement, and a brachial artery pressure measurement was recorded via the AND cuff. The calf circumference gauge was balanced again and the subject was exposed to -50 mmHg of sinusoidal lower body negative pressure at 7 different frequencies, for 2 minutes each. The seven frequencies were 0.01 Hz, 0.02 Hz, 0.04 Hz, 0.08 Hz, 0.10 Hz, 0.125 Hz and 0.15 Hz. These seven frequencies were randomized for each subject, except for the 0.01 Hz frequency, which was always the last frequency. Because 0.01 Hz is the slowest, and therefore most stressful to the body, it came last in the event that the subject developed any pre-syncopal symptoms. However pre-syncopal symptoms never occurred during any frequency of the OLBNP test.

All data for the HUT/LBNP/OLBNP tests were digitized at 250 Hz on a 16-bit analog to digital converter (DI-220 Parallel Port, DATAQ). Data was recorded on a Pentium II class laptop computer. At the end of each subject's test, data were immediately backed up on CD, 100MB Zip disk and 3 different computer hard drives.

Data Analysis

Pre-processing

Training data were acquired as binary Labview files and HUT/LBNP/OLBNP data was acquired using Windaq Pro acquisition software, also as binary files. The data were the imported in to the following three analysis programs written in visual C++ by Dr. David Brown (University of Kentucky, Biomedical Engineering): ConvertLabview.exe, ScanDataq and Browser ConvertLabview.exe and ScanDataq.exe were used to convert the training and tilt test data, respectively, into a binary data format recognizable by Browser. In Browser, heart rate and RR interval were calculated from the ECG trace. Based on the timing of the cardiac cycle from the ECG trace, systolic, diastolic and mean (1/3 systolic + 2/3 diastolic) blood pressure were calculated from the arterial pressure channel. These data were then converted to floating point, 32-bit integer binary data files for export into Matlab.

In Matlab, fread.m and fopen.m subroutines were used to import the data into a matrix for further pre-processing. Once in Matlab, total peripheral resistance was calculated as mean arterial pressure divided by cardiac output. The data were then low-pass filtered with a finite impulse response filter having a cutoff frequency of 5 Hz. Using the filtfilt.m algorithm, these data were passed through the filter forward and backward, to minimize any phase distortions. The data were then down sampled to 10 Hz to save disk space and increase processing speed.

At this point, the data exist in a 21 column matrix with each column consisting of a channel of data as shown in Table 2 of the Appendix. The data were further subdivided into segments for supine control, tilt without LBNP, the tilt plus LBNP segments, recovery and the seven different OLBNP frequencies. For control, tilt, tilt plus LBNP and recovery, two types of segments were created. The first type was a raw segment consisting of all the data, from the very beginning of each stress level to the very end. The second segment type was modified to contain relatively steady-state data. This means that any non-linear trends, such as those seen when subjects experience pre-syncope, were removed from the "steady-state" segments. For the OLBNP segments, there were also two types of segments; a raw segment consisting of all the data for a particular frequency as well as segments of 100 seconds consisting of complete cycles of data for the 0.01, 0.02, 0.04, 0.08, 0.10 and 0.15 Hz segments. For the 0.125 Hz segment, 96 seconds of data were used so that an even number of complete cycles was available for analysis.

Tilt Tolerance

Tilt tolerance was assessed via two methods. The first method was to determine the total time the subject was able to withstand HUT plus any combination of LBNP before developing pre-syncopal symptoms. In this case, time from the raw data set, in seconds, was used for analysis. However, because the level of vacuum applied during LBNP is sometimes slightly variable (+/- mmHg) , and because there are also variations (however minute) in the length of time (+/- seconds) at each LBNP level, a stress index consisting of a combination of tilt time (in seconds) and LBNP (in mmHg) was also used. There is evidence that -50 mmHg of LBNP causes blood pooling similar to 70° head-up tilt (132); therefore the tilt channel was assigned a value of -50 mmHg and added to the LBNP channel, resulting in a new indicator of orthostatic stress in pressure units. Using this method, the initial LBNP applied to the subjects (-20 mmHg) was then given a value approximately equal to 70 mmHg.

Mean Values

For each steady-state segment of data, mean values for each channel were calculated. Data were then averaged by gender and training (i.e. active or passive subjects) group, both before and after training. Standard error of the mean was also calculated for the same groups.

Spectral Power

Spectral power estimations were performed using the power spectral density (psd) algorithm in Matlab. This algorithm utilizes Welch's averaged periodogram method. For HUT/LBNP data, this method works by taking the first 1024 points of data for each variable, removing the mean and any linear trend from this segment and then passing these data through a 1024 point Hanning window. The magnitude of the FFT for this segment is calculated and stored. The program then moves 50% of the segment (512 points) into the data, and does the same thing to the next 1024 points. The magnitude-squared of these two FFT segments are averaged to form the new output. The algorithm continues this process until it reaches the end of the data. If at any time there are less than 1024 points, the data is zero padded to length 1024. The output of the PSD algorithm was then integrated over the low frequency (LF, 0.04 – 0.15 Hz) and high frequency (HF, 0.15 – 0.40 Hz) regions.

For OLBNP data, first harmonic amplitudes and phases of the fast fourier transform (FFT) are reported. For all frequencies other than 0.125 Hz, complete cycles could be obtained with 100 second (1000 pt) segments and for 0.125 Hz, 960 points of data were used to obtain 8 complete cycles at this frequency. Phase outputs are reported with respect to OLBNP input.

Blood Assays

Catecholamine assays were performed in Dr. Michael Ziegler's lab at the University of California, San Diego using a radioeznymatic technique (81). Other vasoactive hormones were analyzed by Dr. Helmut Hinghofer at the University of Graz, Austria using commercially available kits.

Baroreflex Analysis

Sensitivity of the cardiac baroreflex (BRS) as well as number of cardiac barosequences (NNS, normalized by number of heart beats) were assessed using self-written script files in Matlab. Baroreflex activity (BA, sensitivity and normalized number of sequences) was calculated for all HUT/LBNP segments as well as for data early and late in HPC training. For training data, the BA numbers reported are averaged from two days selected within the first four days of training and within the last three days of training. On each day of training, 7 segments at 2.5 G_z and 8 segments at 1.0 G_z are analyzed.

For each segment of data, the ECG trace is used to calculate beat-to-beat RR Interval (RRI) and systolic blood pressure (SBP). Each SBP sequence is analyzed for a sequence of three or more beats increasing or decreasing in succession, with each change between beats being 1 mmHg or more. During these sequences, the RRI is examined (on a one beat delayed basis) for changes in the same direction as the SBP changes, with each change being 8 ms or more. Eight ms is chosen because ECG was digitized at 250 Hz, so each R-wave can only be resolved within 4 ms. This leads to a possible 8 ms error when comparing 2 beats, hence the 8 ms criteria for changes in RRI.

Each barosequence is plotted as RRI vs. SBP, and the slope of the best fit line between the points is calculated from Equation 1 below as an index of BRS. The NNS is calculated as the number of barosequences (*n*) divided by the total number of heart beats in each analyzed segment of data.

$$BRS = Slope = \frac{n\left(\sum RRI * SBP\right) - \left(\sum RRI\right)\left(\sum SBP\right)}{n\left(\sum RRI^2\right) - \left(\sum RRI\right)^2} \qquad \text{Equation 1}$$

$$NNS = \frac{n}{Number\_of\_Heart\_Beats} \qquad \text{Equation 2}$$

Statistics

Four factor analysis of variance (ANOVA) was used to calculate significance between all groups using SAS (The SAS Institute) software. Between group variables were gender (male vs. female) and training group (active vs. passive) and within group variables were test day (before vs. after training) and stress level (control/tilt/LBNP level or in the case of OLBNP, the LBNP input frequency). Fischer's least significant difference method was used, therefore significance was accepted for $p < 0.05$. An example of SAS code used is presented in Appendix B.

Chapter 4: Results

A subject's typical response to a HUT/LNBP test is shown below in Figure 4.1. All other individual responses are shown in Appendix A.

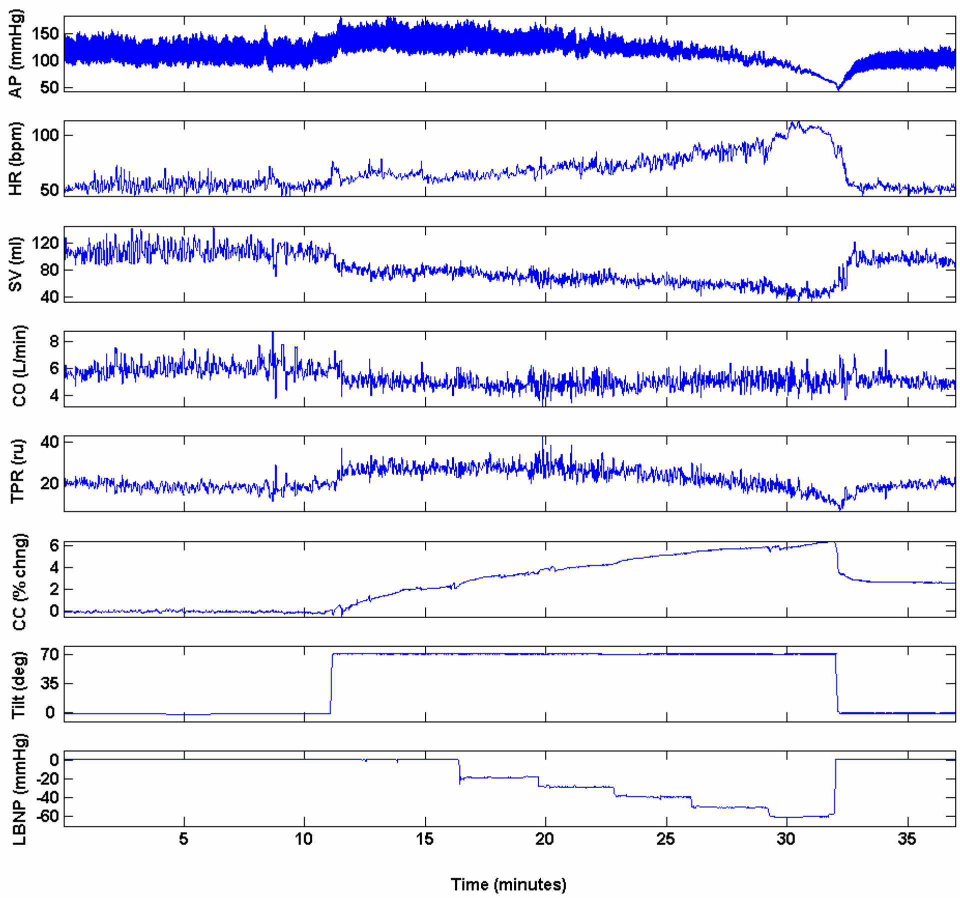

Figure 0.1: Typical AP, HR, SV, CO, TPR and CC responses of a presyncopal subject to 70º HUT combined with progressive levels of LBNP.

At the onset of tilt, the calf circumference starts to rise, indicative of fluid accumulating in the lower leg. In response to this shift of fluid, heart rate and vascular resistance increases to maintain venous return and blood pressure. In the case of this subject, this is seen as an increase in blood pressure. Stroke volume decreases as the heart rate increases, as there is less filling time. These changes continue as lower body negative pressure is applied. This particular subject withstood -60 mmHg of LBNP before developing classical vasovagal syncope, indicated by decrease in blood pressure, heart rate and vascular resistance.

There were varying degrees of tolerance among the subjects, and only a very few were able to endure the stress long enough to make to the higher vacuum levels (-50 and -60 mmHg). The only segments that all subjects had in common were the 10 minute supine control period and the 5 minute HUT period before any LBNP was applied. Although one subject experienced presyncopal symptoms before the vacuum was applied, most subjects were able to endure the passive HUT. After application of LBNP, tolerance ranged from a few seconds at the -20 mmHg level to some subjects enduring several minutes of -60 mmHg. Because of this difference in how each subject endured LBNP, each subject's response during the last four minutes (LST4) of stress, regardless of LBNP level, was also assessed. This LST4 value was assessed before presyncopal symptoms develop. For the above reasons data are presented for 5 different experimental levels (referred to in the following discussion as "segments"): control, tilt (w/o LBNP), -20 mmHg LBNP, LST4 and recovery.

Effects of Artificial Gravity on HUT/LNBP Tolerance

Artificial gravity training increased HUT/LNBP tolerance in the group of 26 subjects by 13% (t-test, $p < 0.02$, Figure 4.2). As shown in Figure 4.2 below, men lasted longer during the HUT/LNBP test than did women ($p < 0.01$). When examined separately, the group of active subjects (men and women combined) were improved by training ($p < 0.05$) as were the men (active and passive combined, $p < 0.04$). Passive women were not improved by training. When using the "stress index" (Method two) no differences were indicated from those already obtained from the standard "time of tilt" analysis.

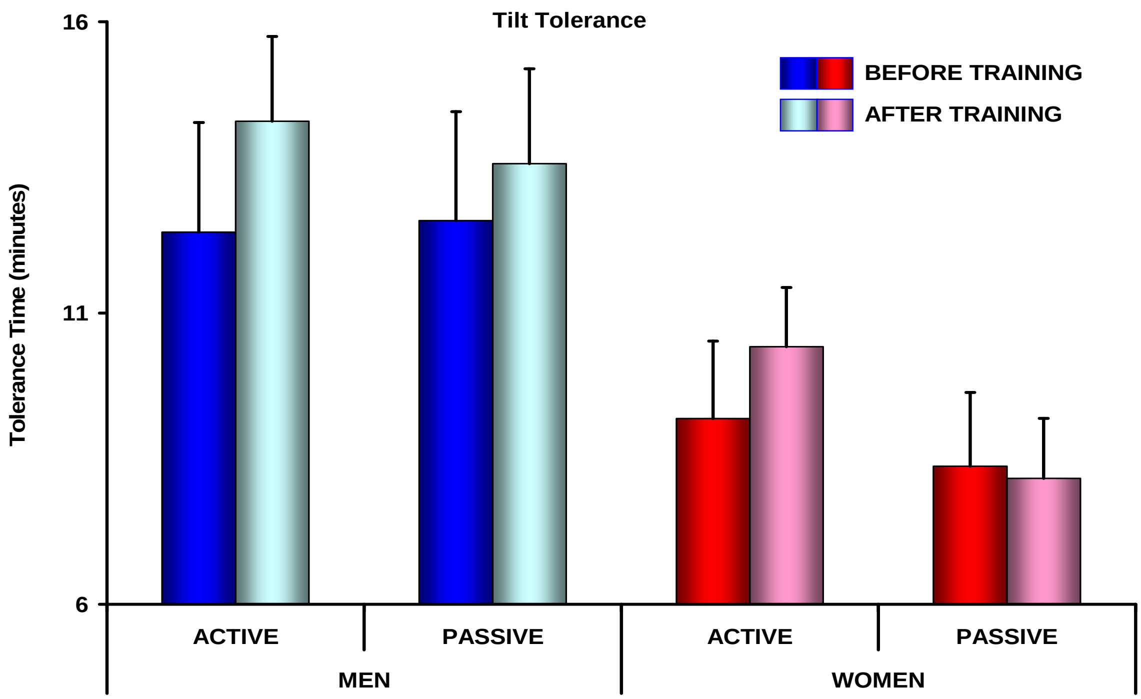

Figure 0.2: Tilt tolerance time shown for men (left, 7 active, 7 passive) and women (right, 7 active, 5 passive), before and after artificial gravity training.

Mean Values for HUT/LNBP Test Before and After AG Training

Arterial Pressure

Mean values of arterial pressure are shown in Figure 4.3. When pooling all data to make segment-only comparisons, AP was not different from segment to segment (i.e., there were no main segment effects in the ANOVA).

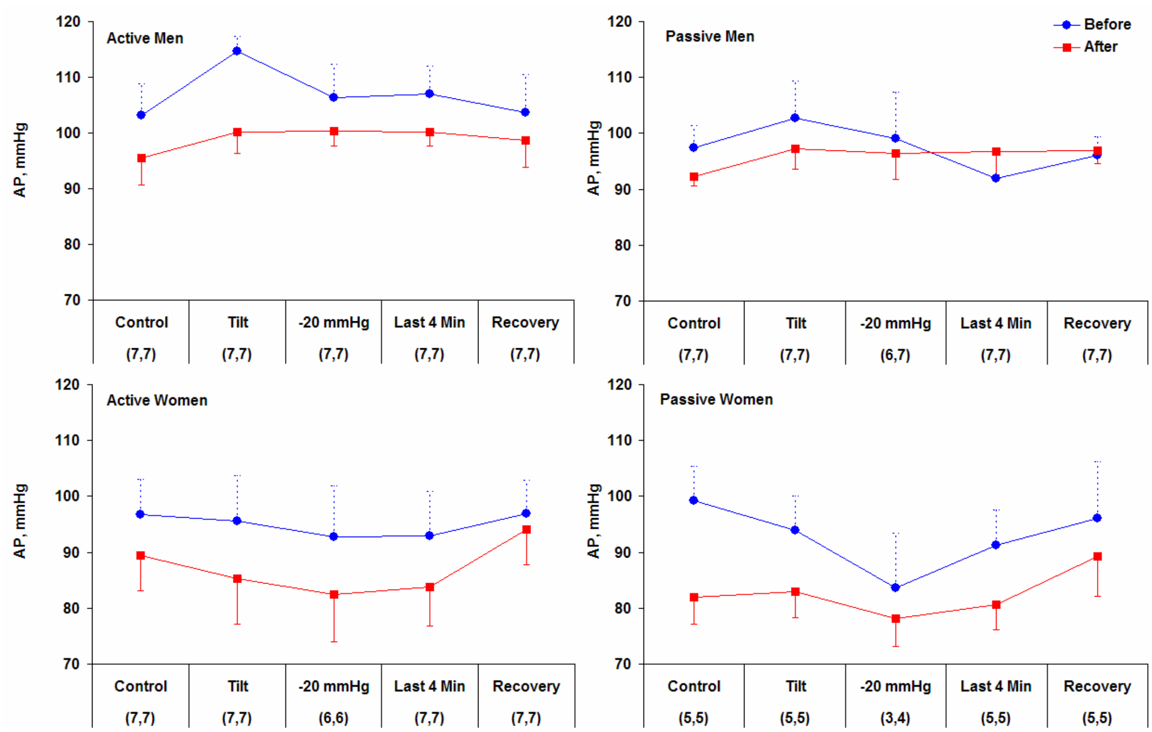

Figure 0.3: Blood pressure by gender and training group, before and after AG training.

While there was no overall difference in blood pressure during different levels of orthostatic stress when pooling both men's and women's data, separating gender did elucidate some different responses to orthostatic stress. Compared to supine control, men *increased* AP during HUT and -20 mmHg LBNP while women *decreased* AP during -20 mmHg LBNP, Figure 4.4. Men had higher AP (99.8 ± 1.1 mmHg) than women (89.7 ± 1.6 mmHg), Figure 4.4.

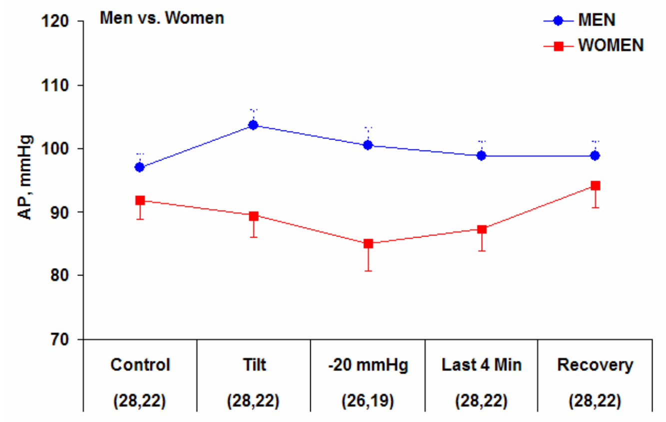

Figure 0.4: Gender by segment difference in blood pressure.

Artificial gravity training decreased blood pressure in all subjects, Figure 4.5.

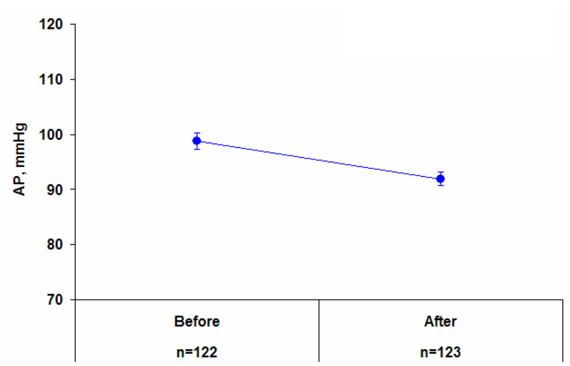

Figure 0.5: Mean AP (for all segments of the HUT/LNBP test) before and after AG training.

Heart Rate

In response to increasing orthostatic stress, heart rate increased as would be expected. Heart rate increased from control to HUT, HUT to -20 mmHg LBNP, and -20mmHg LBNP to LST4 before returning to control levels during recovery, Figure 4.6. There was no overall effect of training, although there was a training by segment interaction – heart rate was higher during the last 4 minutes of stress after training (98.4 ± 4.2 bpm before, 104.5 ± 3.3 bpm after training).

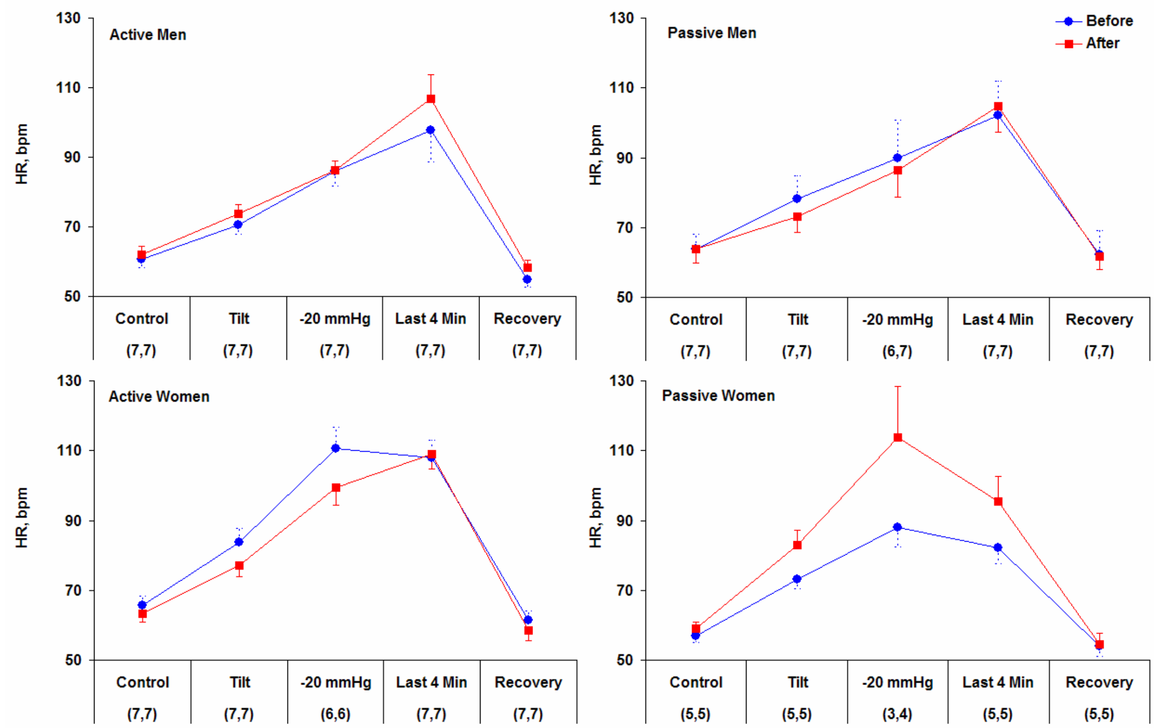

Figure 0.6: Heart rate by gender and training group, before and after AG training.

Regardless of test day (i.e. regardless of before or after training), women had higher HR during -20 mmHg LBNP than did men, Figure 4.7.

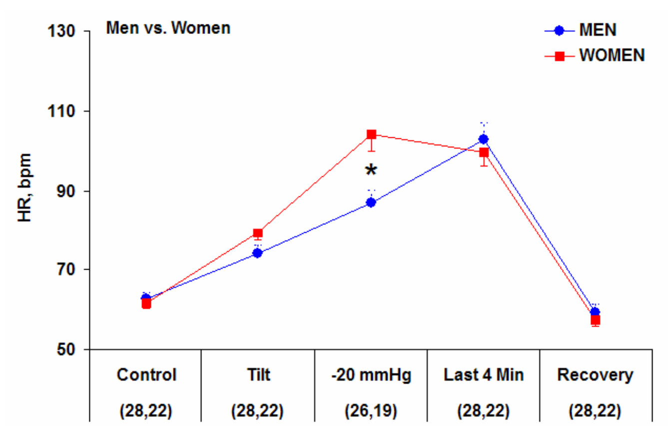

Figure 0.7: Gender by segment difference in heart rate. *Significant difference between gender.

Stroke Volume

Mean stroke volume decreased with HUT and -20 mmHg LBNP. Statistically, the mean value of SV during LST4 was not different from -20 mmHg LBNP, although it was significantly lower than control and recovery. The recovery value of SV was higher than the control value, Figure 4.8.

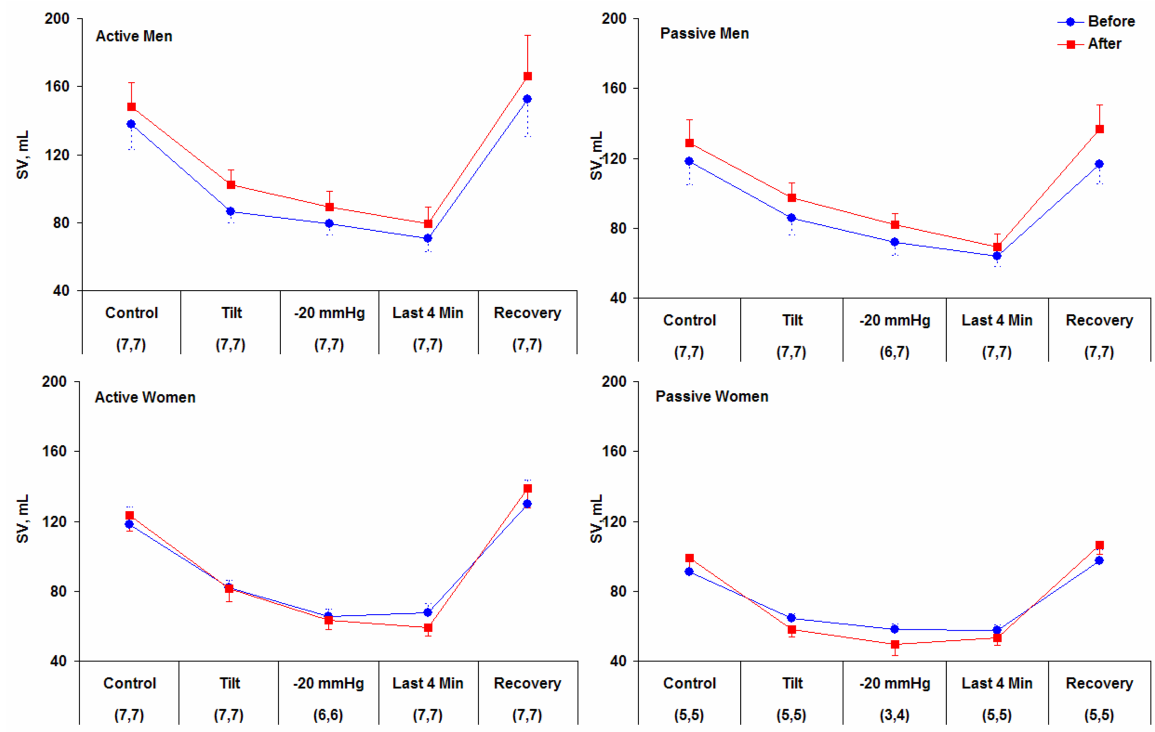

Figure 0.8: Stroke volume by gender and training group, before and after AG training.

Men had a higher stroke volume than did women (Figure 4.9a) and training increased overall stroke volume (Figure 4.9b).

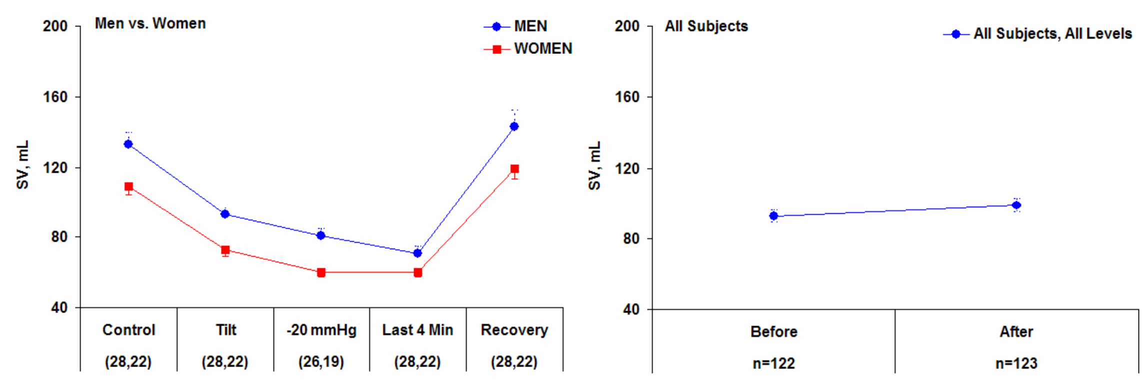

Figure 0.9: (a) Gender difference in stroke volume, (b) AG training effect on stroke volume.

Cardiac Output

Cardiac output initially decreased with the onset of HUT, but then was maintained as the test progressed, reaching control values again during supine recovery, Figure 4.10.

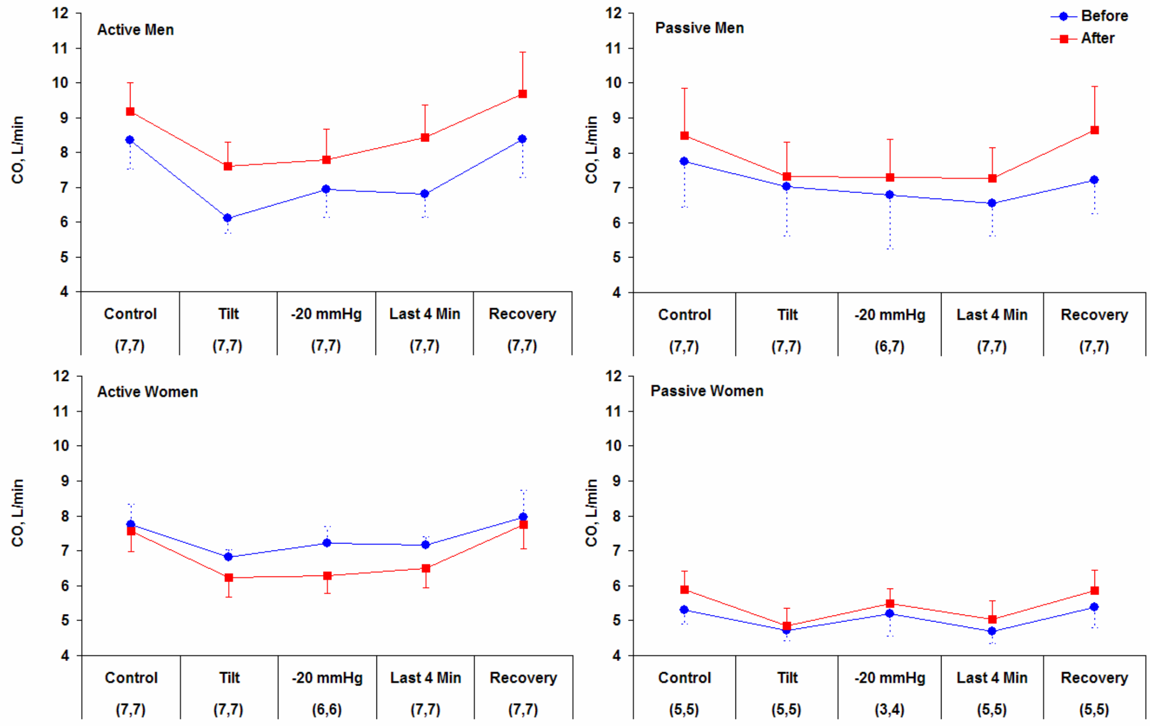

Figure 0.10: Cardiac output by gender and training group, before and after AG training.

Men appear to have had a higher cardiac output than women (Figure 4.11a) but this was only at a marginally significant level (p = 0.068). When examined as a function of test day, men had a higher cardiac output after training than before training, and this after training value was higher than women's CO on both experimental days (Figure 4.11b).

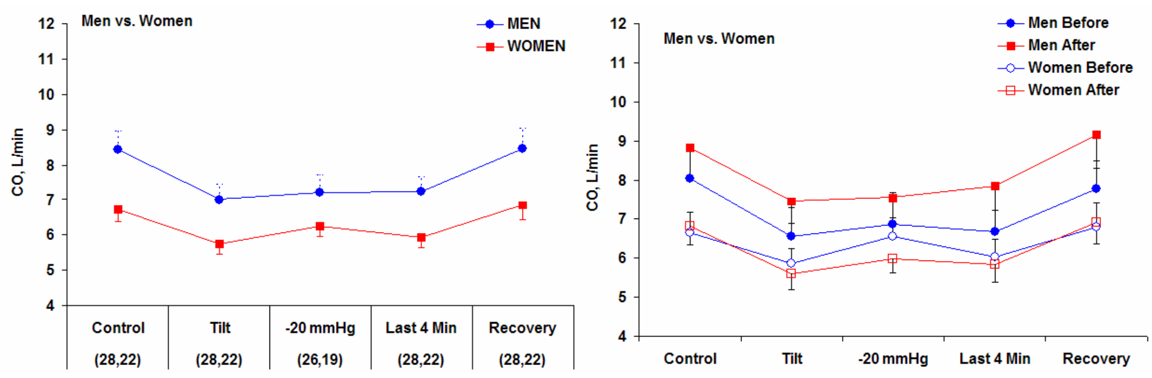

Figure 0.11: (a) Gender difference in cardiac output, (b) gender by test day effect on cardiac output.

End Diastolic Volume

Similar to stroke volume, end diastolic volume decreased at the onset of tilt, and continued to decrease with the onset of LBNP. Also similar to stroke volume, the LST4 value was not different from the -20 mmHg LBNP value and the EDV recovered to a level higher than control, Figure 4.12.

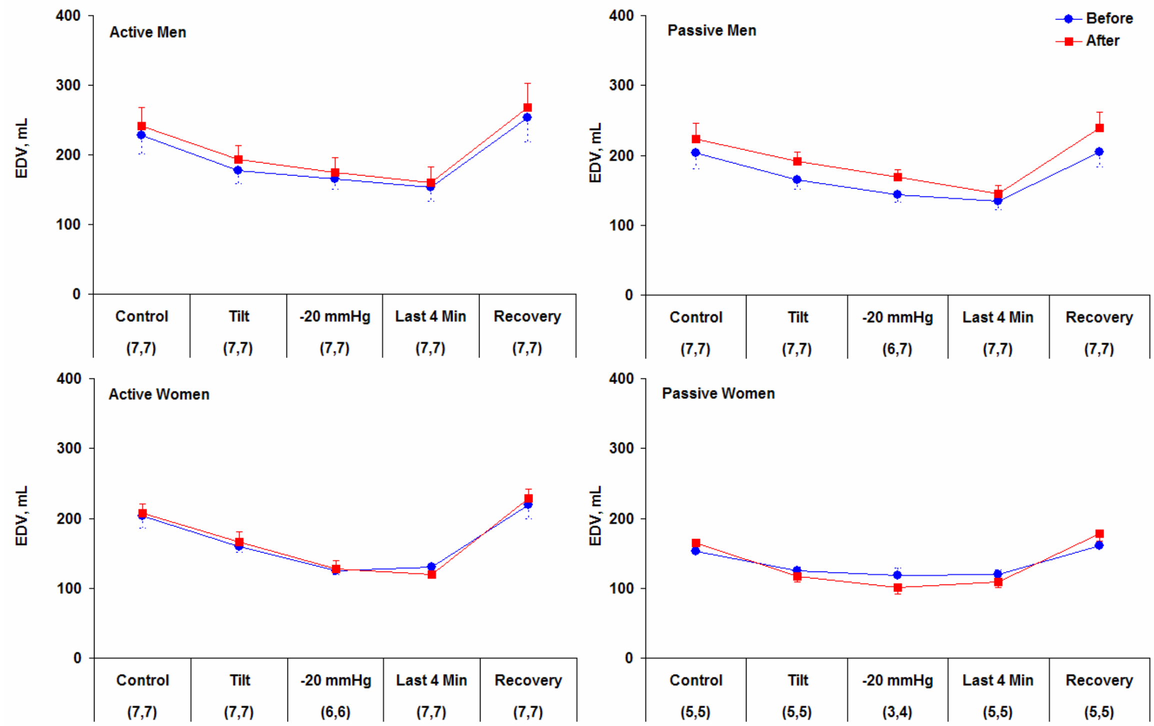

Figure 0.12: End diastolic volume by gender and training group, before and after AG training.

Men had higher EDV than women (Figure 4.13a). There was not a main training effect in the ANOVA, but there was a training-induced increase in EDV during control and recovery (Figure 4.13b).

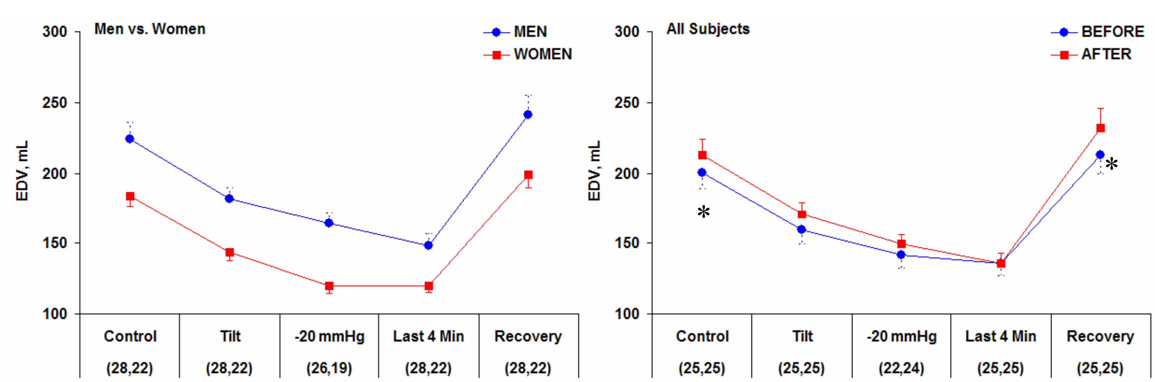

Figure 0.13: (a) Gender difference in EDV, (2) day by segment effect on EDV. *Significant effect of training.

Total Peripheral Resistance

Total peripheral resistance increased in response to HUT (Figure 4.14). TPR was maintained when LBNP was started, but was significantly lower than the HUT value during the last 4 minutes of stress. TPR recovered to the control value during recovery.

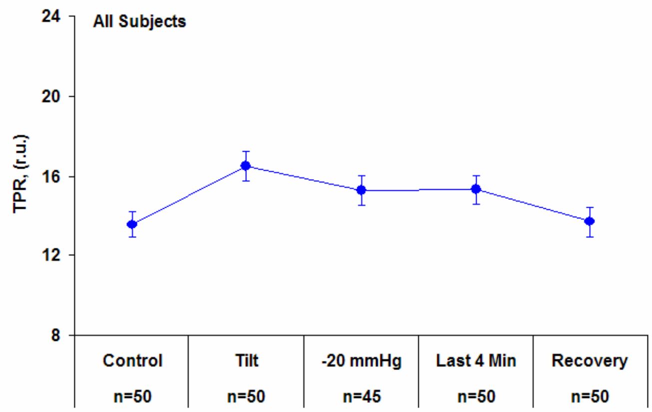

Figure 0.14: TPR means by stress level.

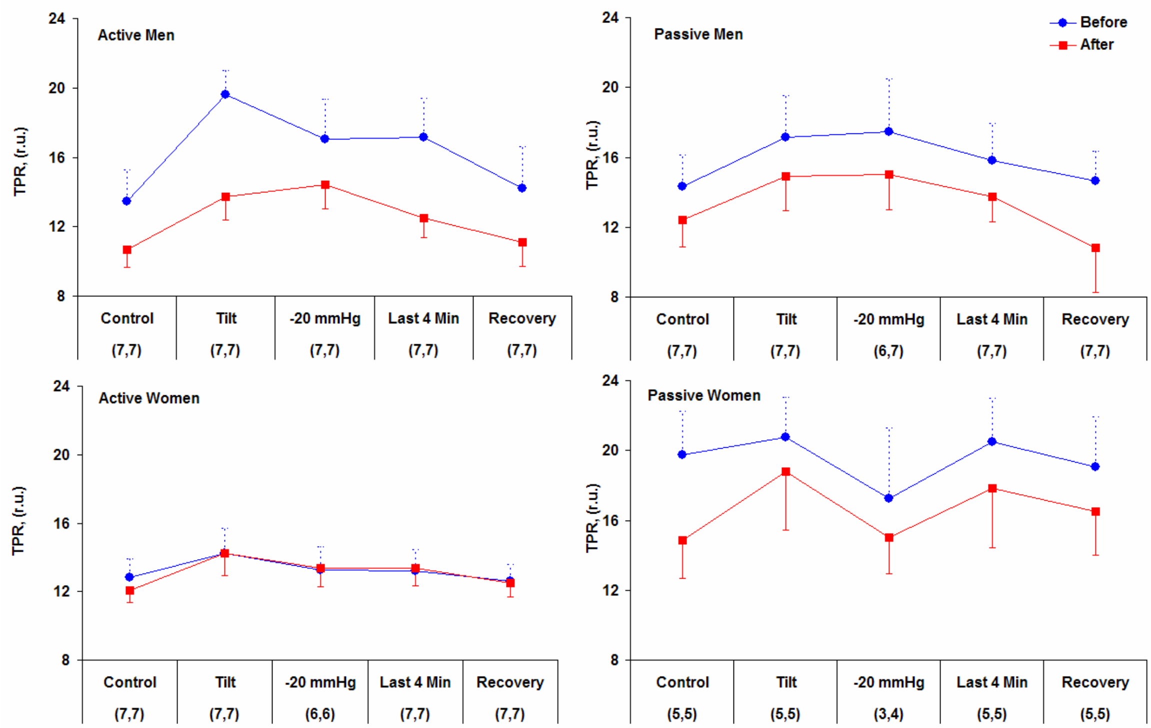

Figure 0.15: Total peripheral resistance by gender and training group, before and after AG training.

ANOVA results indicate that artificial gravity training decreased TPR, but this can be misleading, as Figure 4.15 (above) shows that TPR isn't increased in active women after training. This was corroborated by a protocol by gender interaction effect, indicating that training decreased TPR in active men, passive men and women, but not in active women. Notice, however, that active women have a lower TPR before any artificial gravity training, and their before/after values look similar to the after values of the other 3 groups.

Calf Circumference

Due to the time-dependant nature of calf circumference during an orthostatic stress, absolute values of CC had to be normalized by time of stress, Figure 4.16.

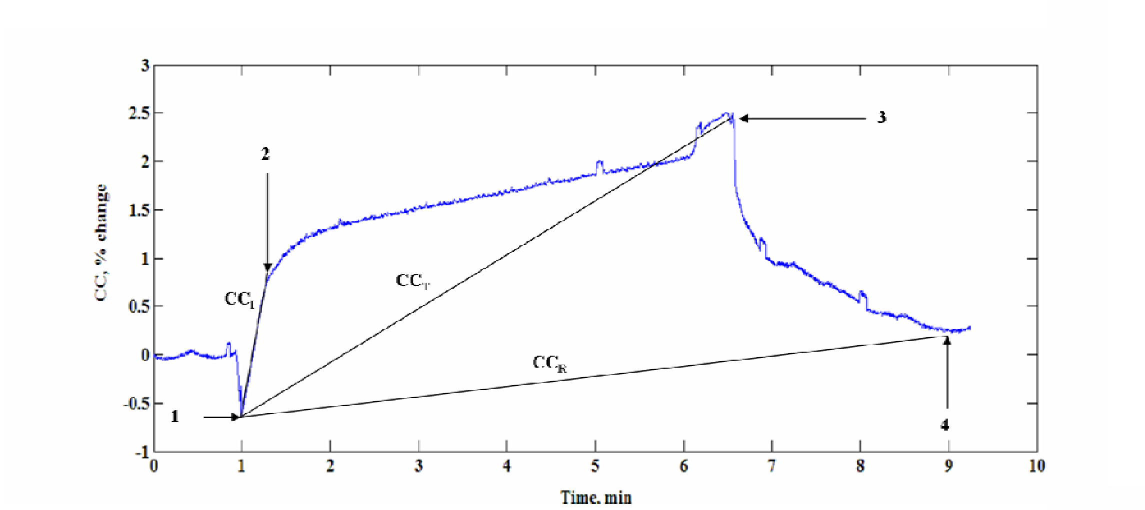

Figure 0.16: Various calf circumference slopes measured.

CC_I refers to the initial slope at the onset of tilt, from point one to two on Figure 4.16. This refers to the initial shift of fluid from the upper body to the lower legs, and usually lasts about 15 to 20 seconds before the slope decreases significantly. CC_T is the value of CC at the end of HUT/LBNP normalized by the time of stress, or the slope of the line from point 1 to 3., This represents the total fluid shift during the orthostatic stress. CC_R is the value that the CC recovers to at the end of recovery, normalized by the amount of time up to that point, given by the slope of the line from point one to four. This slope represents the amount of fluid left in the lower leg several minutes after the end of the orthostatic test. Point four is the lowest value that CC reaches during the recovery period, which usually occurs near the end of the recovery period; however, motion artifact or drift in the signal sometimes required this value to be sampled a couple minutes before the end of the five minute recovery period. There was no change in CC_I

or CC_T after training, nor were there any differences between gender or training groups. On the other hand, CC_R was increased after training (main effect), especially in the active subjects (interaction effect), Figure 4.17. Both active men and active women increased CC_R after training, while passive women *decreased* CC_R after training (marginally significant, p = 0.07).

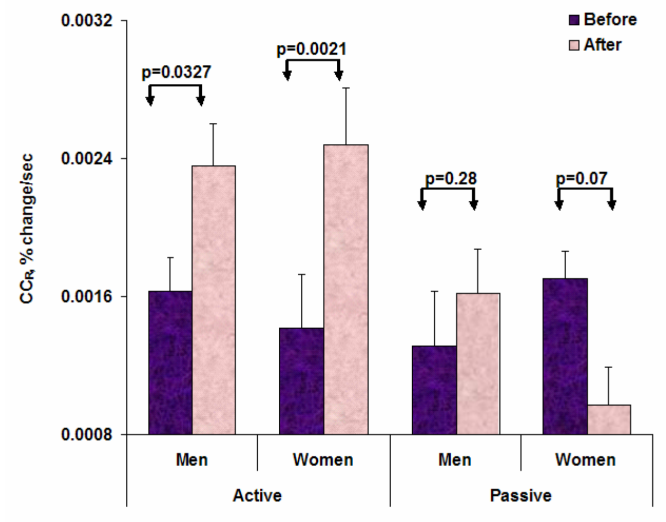

Figure 0.17: CCR by gender and training group.

Spectral Power Analysis of Responses to HUT/LNBP Test Before and After Artificial Gravity Training

Power spectrum analysis of arterial pressure and RR interval data has been used as a non-invasive index of sympathetic (low frequency, LF, 0.04 – 0.15 Hz) and parasympathetic (high frequency, HF, 0.04 – 0.15 Hz) nervous system control (1, 41, 98). In addition to analyzing the power spectrum of AP and HR, power spectrum of SV, EDV, CO and TPR was estimated to determine if artificial gravity training had any effect on these indices.

Arterial Pressure

Head-up tilt and LBNP increased low-frequency spectral power of blood pressure, Figure 4.18. Spectral power during LST4 was higher than all segments other than -20 mmHg LBNP.

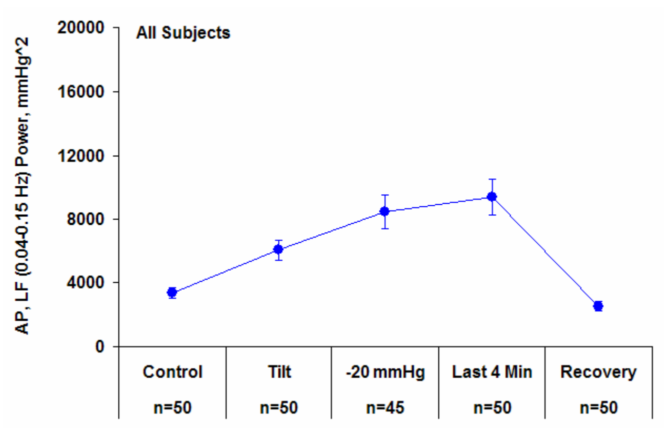

Figure 0.18: Low frequency AP spectral power averaged for all subjects.

Low frequency AP spectral power was not affected by training, and there were no gender or training protocol differences. High frequency spectral power was increased by stress as well, but only during -20 mmHg and LST; tilt-induced HF spectral power was not significantly greater than control, Figure 4.19.

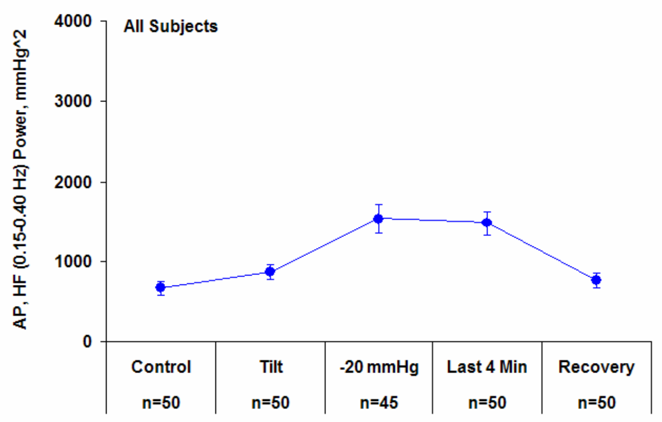

Figure 0.19: High frequency spectral power averaged for all subjects.

High frequency spectral power in men was lower than in women, Figure 4.20a. Women decreased high frequency power as a result of training (p = 0.02) while men tended to increase power with training (NS), Figure 4.20b.

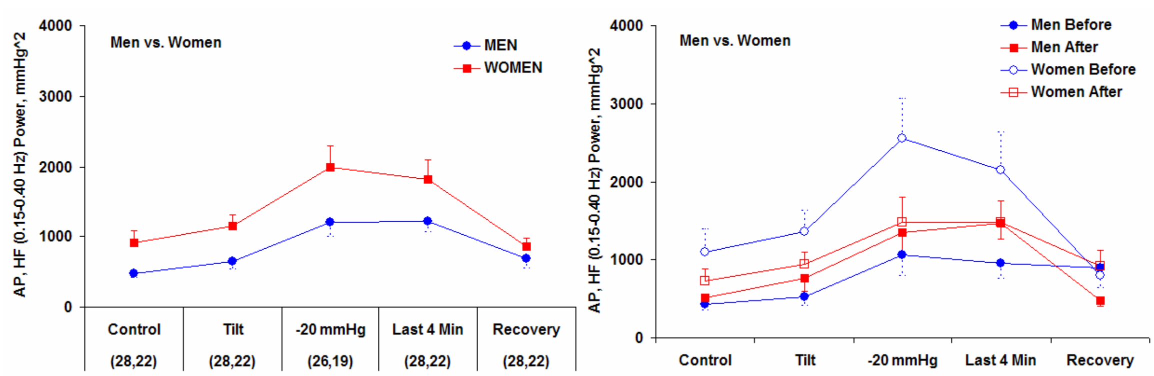

Figure 0.20: (a) High frequency AP spectral power by gender and (b) by gender and day.

Heart Rate

Orthostatic stress increased low frequency spectral power of heart rate (HUT/-20mmHg LBNP/LST4 all higher than control and recovery, Figure 4.21a). Artificial gravity training increased low frequency spectral power at -20mmHg and LST4, Figure 4.21b.

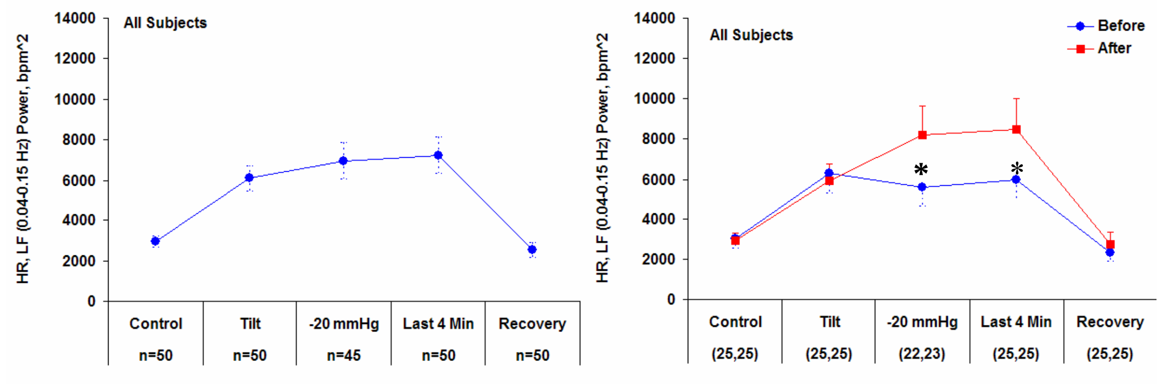

Figure 0.21: (a) Low frequency HR spectral power averaged across all subjects and (b) separated by day. *Significant effect of training.

Orthostatic stress had the opposite effect on high frequency HR spectral power, Figure 4.22a. Spectral power at -20mmHg LBNP and LST4 was significantly lower than in control and recovery. There was a marginally significant difference in gender (women > men, p = 0.07), Figure 4.22b.

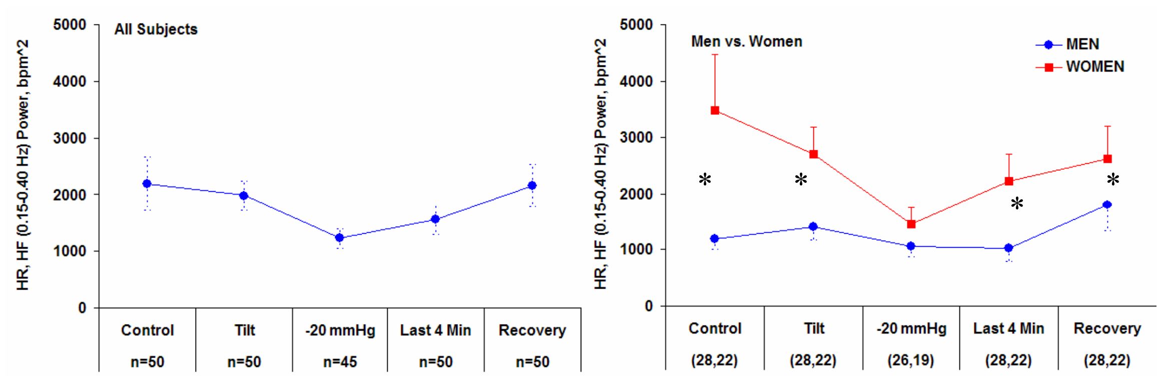

Figure 0.22: High frequency HR spectral power averaged across all subjects and (b) separated by gender. *Significant difference between gender.

Stroke Volume

Low frequency spectral power of stroke volume decreased during HUT, but was independent of orthostatic stress level, Figure 4.23a. Both supine values were higher than tilt, -20 mmHg LBNP and LST4 (which are not statistically different than each other). An unexpected result was that LF spectral power was higher in recovery than in control. This effect was compounded after training, Figure 4.23b.

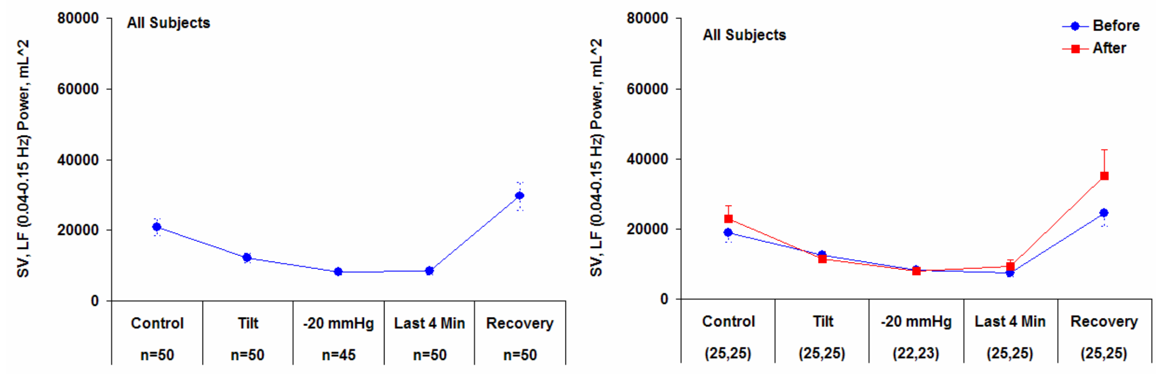

Figure 0.23: (a) Low frequency SV spectral power across all subjects and (b) separated by day.

High frequency spectral power of stroke volume was not affected by orthostatic stress level. There was no main gender effect, although men did show higher power after training than before, Figure 4.24.

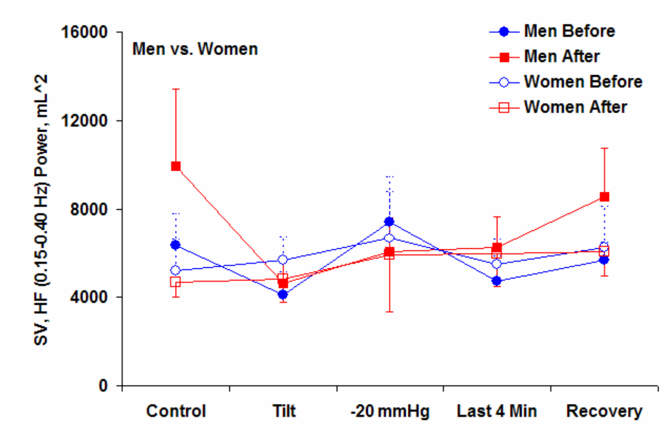

Figure 0.24: High frequency SV spectral power for men and women, before and after training.

Cardiac Output

Low frequency cardiac output spectral power tended to be lower during orthostatic stress than in control, but this effect was only significantly different between control and -20 mmHg LBNP, Figure 4.25. Similar to stroke volume, LF spectral power was elevated during recovery.

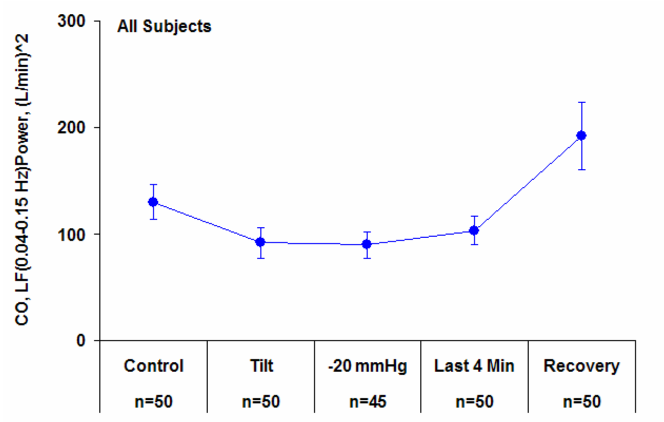

Figure 0.25: Low frequency CO spectral power averaged across all subjects.

High frequency spectral power of cardiac output was decreased by HUT alone, Figure 4.26. Application of -20 mmHg LBNP increased HF CO spectral power ($p = 0.06$) and CO power remained elevated during the last 4 minutes of stress ($p < 0.05$).

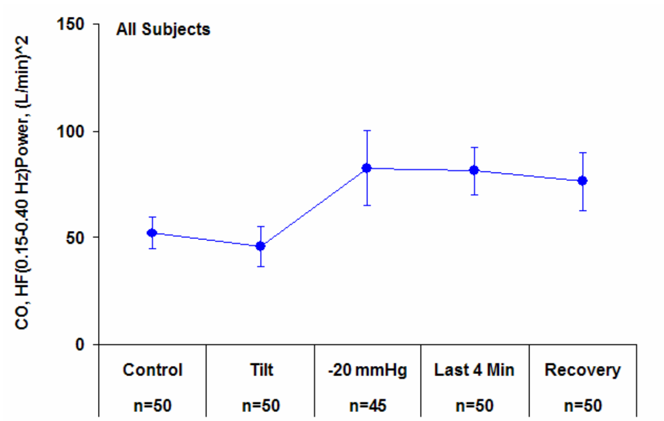

Figure 0.26: High frequency CO spectral power averaged across all subjects.

End Diastolic Volume

End diastolic volume LF spectral power behaved in a fashion similar to cardiac output, Figure 4.27. There was no significant difference between control and HUT, but power at -20 mmHg LBNP was statistically lower than control. Power difference between control and LST4 was only marginally significant ($p = 0.06$). Also like cardiac output LF power, recovery power was significantly greater than all other stress levels, including supine control. There were no significant effects in high frequency EDV spectral power.

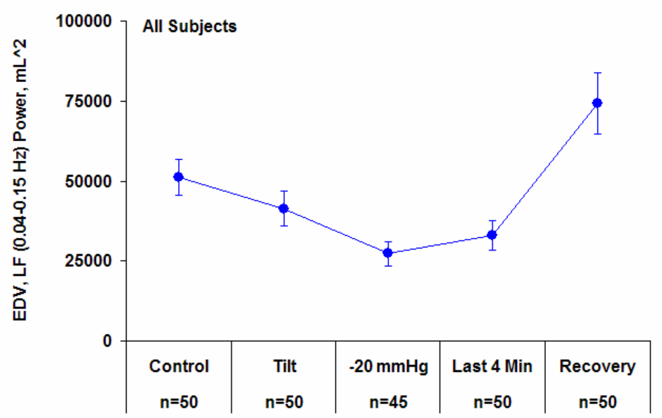

Figure 0.27: Low frequency EDV spectral power averaged across all subjects.

Total Peripheral Resistance

Orthostatic stress increased low frequency TPR spectral power, Figure 4.28. Control and recovery power were both significantly lower than power during all levels of stress. Power was not different during tilt, -20 mmHg LBNP and LST4.

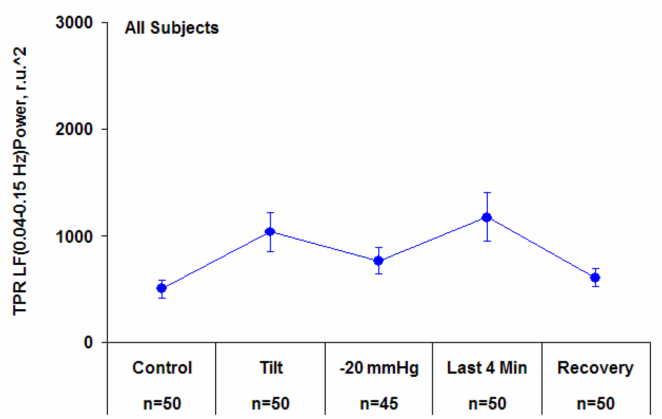

Figure 0.28: Low frequency TPR spectral power averaged across all subjects.

There were no main gender or training day effects, though there was an interaction effect between gender/day/stress level, Figure 4.29. Women's low frequency TPR power in tilt and LST4 was significantly higher than the power of all other groups (women before, men before, men after) during these two stress levels.

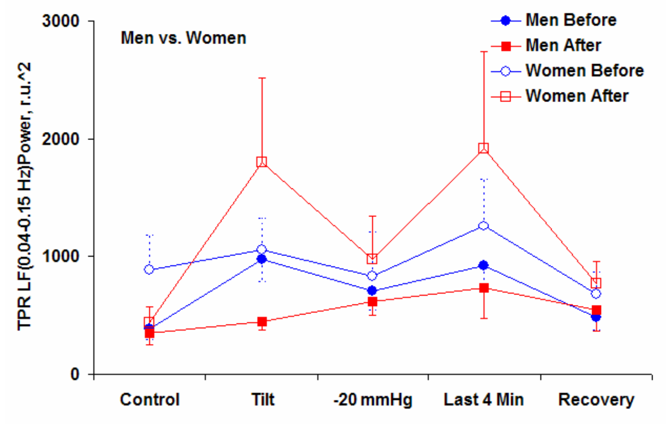

Figure 0.29: Low frequency TPR spectral power for men and women, before and after training.

High frequency spectral power of TPR was also elevated during orthostatic stress, Figure 4.30a. Power during Tilt, -20 mmHg and LST4 was higher than power during control and recovery, with LST4 HF power being higher than all levels. Women had higher HF TPR power than did men, Figure 4.30b. There was no effect of training.

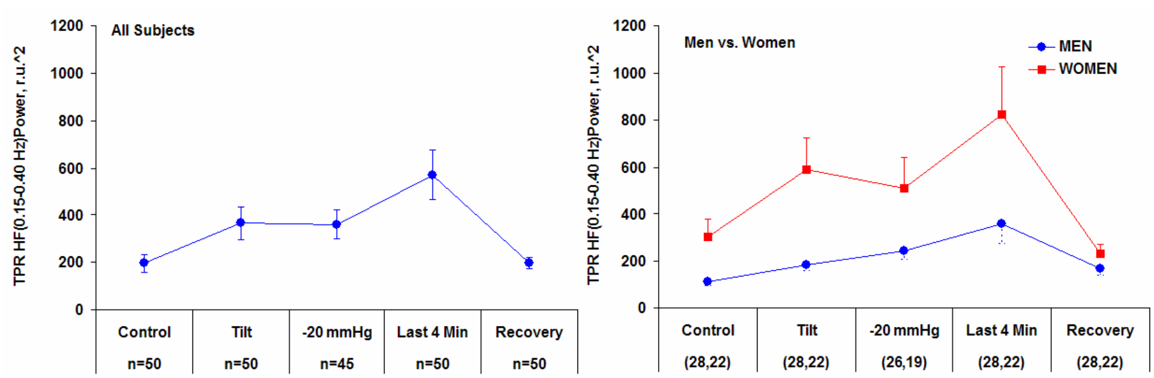

Figure 0.30: (a) High frequency spectral power averaged across all subjects and (b) by gender.

Responses to OLBNP Test Before and After Artificial Gravity Training

Arterial Pressure

Arterial pressure amplitude response tended to decrease as input frequency increases, Figure 4.31a. Amplitudes at 0.10 Hz, 0.125 Hz and 0.15 Hz were lower than at 0.01 Hz. At 0.04 Hz; the amplitude response was significantly higher than the response at all frequencies except for 0.01 Hz. There were no other gender, protocol or day effects, although there was a gender by protocol by segment effect; active women had a higher amplitude response than passive women at 0.04 Hz, and higher than active men at 0.04 Hz and 0.08 Hz. Passive women had a higher amplitude response at 0.01 Hz than did passive men, Figure 4.31b.

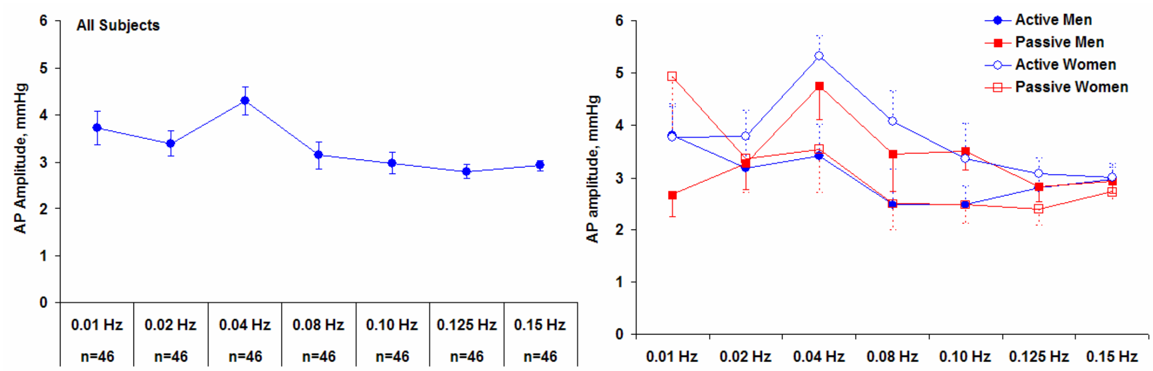

Figure 0.31: (a) AP amplitude response averaged across all subject and (b) by gender and training group.

In general, AP phase response did not vary with input frequency, except at 0.08 Hz, Figure 4.32. The AP phase response at this frequency was significantly higher than the response at all other input frequencies.

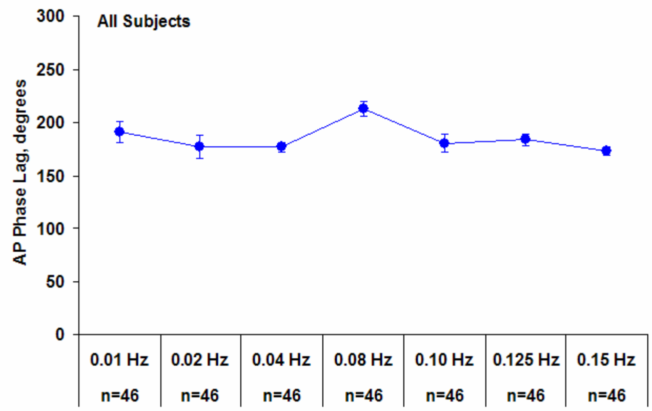

Figure 0.32: AP phase lags averaged across subjects.

Heart Rate

Heart rate amplitude response was significantly higher at the two lowest input frequencies, 0.01 Hz and 0.02 Hz than at all other input frequencies, Figure 4.33a. There was no change in amplitude response from 0.04 Hz to 0.15 Hz. The only gender difference occurred at 0.01 Hz, where women had a higher amplitude response than did men, Figure 4.33b.

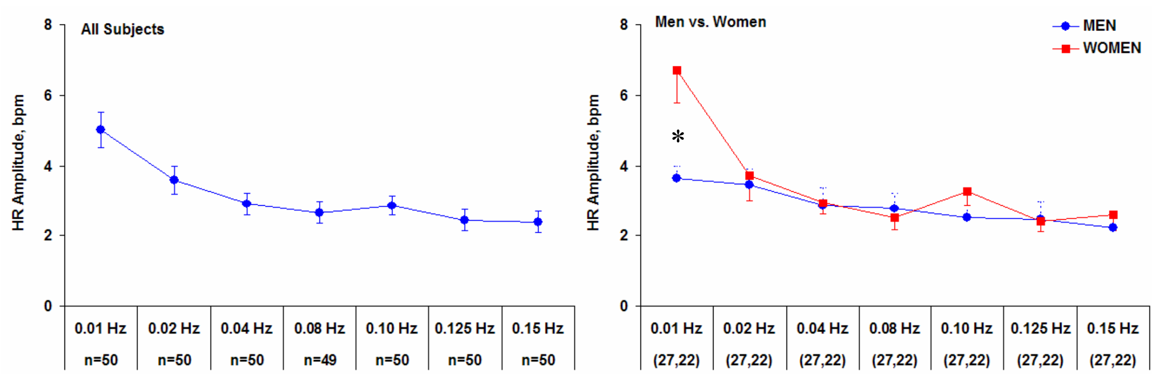

Figure 0.33: (a) HR amplitudes averaged across all subjects and (b) by gender. *Significant difference between gender.

There was no overall effect of artificial gravity training, although there were a few training day interactions between protocol and segments, Figure 4.34 below. At the slowest input frequency, 0.01 Hz, active training decreased HR amplitude. This amplitude response (at 0.01 Hz) for the active group after training was lower than the responses for the passive group on both test days. At the second slowest input frequency, 0.02 Hz, passive training *increased* HR amplitude.

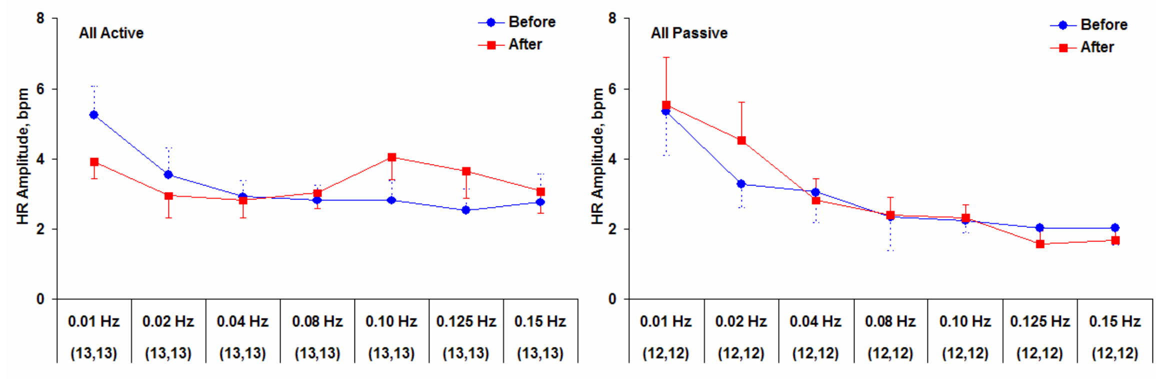

Figure 0.34: HR amplitude for actives (a) and passives (b), before and after training.

Increased input frequency was associated with a slower response, Figure 4.35. There was no difference between the phase lags at 0.01 to 0.04 Hz; however, the phase lag at these three frequencies were significantly lower than the lag at each of the input frequencies from 0.08 to 0.15 Hz. Similar to the lag at the three lowest frequencies, the lag at the 3 highest frequencies were not different from each other.

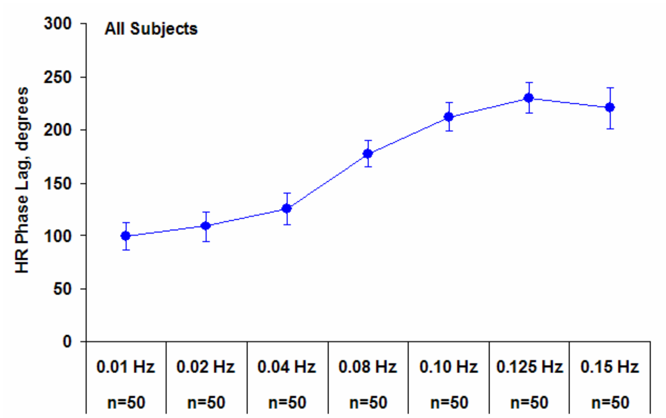

Figure 0.35: HR phase lags averaged across all subjects.

While there was no overall gender difference in the phase response, women responded differently than men at higher input frequencies, Figure 4.36 below. Women significantly increased phase lags from 0.04 Hz to 0.08 Hz, and nearly significantly ($p = 0.08$) increased phase lags from 0.08 to 0.10 Hz. Men did not have these slower responses from 0.04 to 0.08 Hz ($p=0.42$) or from 0.08 to 0.10 Hz ($p=0.59$). Additionally, women's phase lags at 0.125 and 0.15 Hz was higher than at 0.08 Hz, while there was no difference in phase for men from 0.08 to 0.15 Hz.

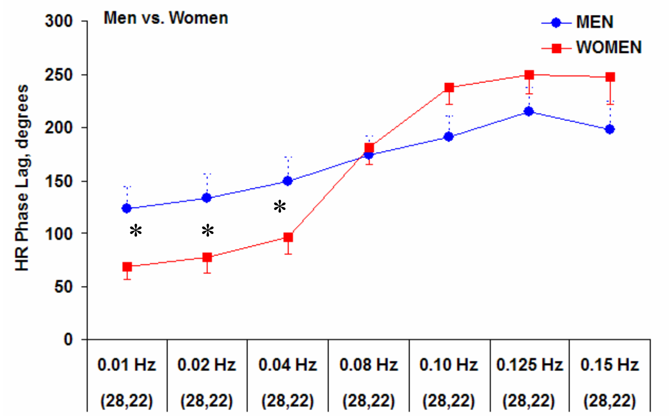

Figure 0.36: HR phase lags by gender. *Significant gender difference.

Stroke Volume

Stroke volume amplitude during the slowest input frequency was higher than the response at every other input frequency, Figure 4.37. Stroke volume amplitude response at 0.02 Hz was higher than the response at 0.08, 0.125 and 0.15 Hz.

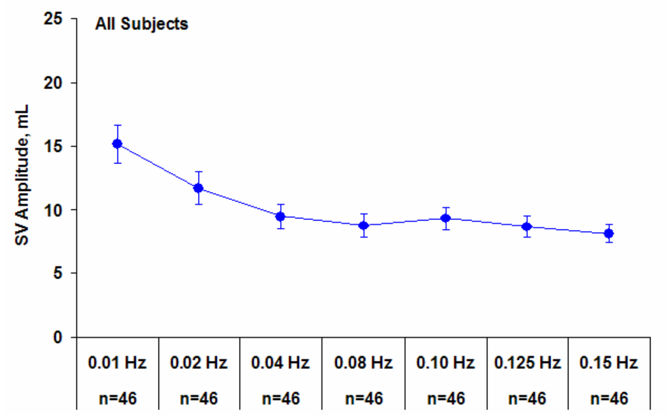

Figure 0.37: SV amplitudes averaged across all subjects.

There was no difference between gender, but there was a training effect; stroke volume amplitude response was higher in passive subjects after training than before training, Figure 4.38. There was no difference in the active subjects.

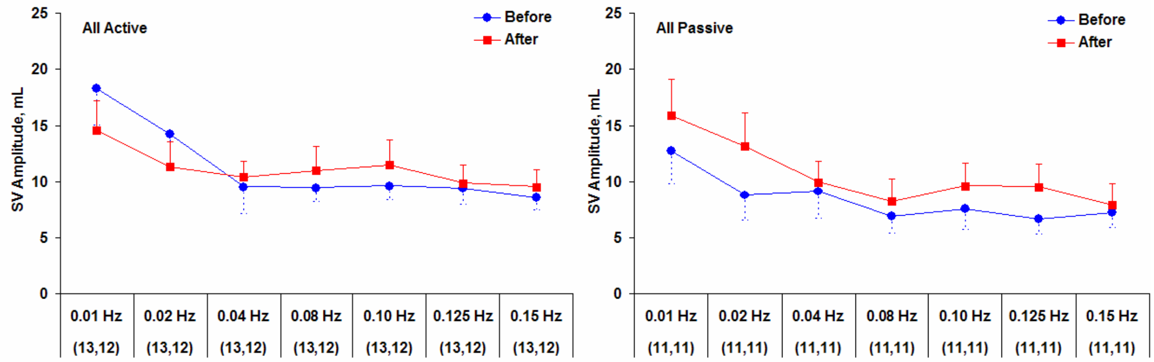

Figure 0.38: SV amplitudes for active (a) and passive (b) groups, before and after AG training.

In general, phase lag increased as input frequency increased, Figure 4.39a. Phase at 0.01 Hz was lower than at 0.04, 0.10, 0.125 and 0.15 Hz. Phase lag increased from 0.10 to 0.125 Hz and from 0.125 to 0.15 Hz. At 0.04 Hz, phase lag was higher than at 0.01, 0.02 and 0.08 Hz. Men had significantly lower phase lags than did women, Figure 4.39b.

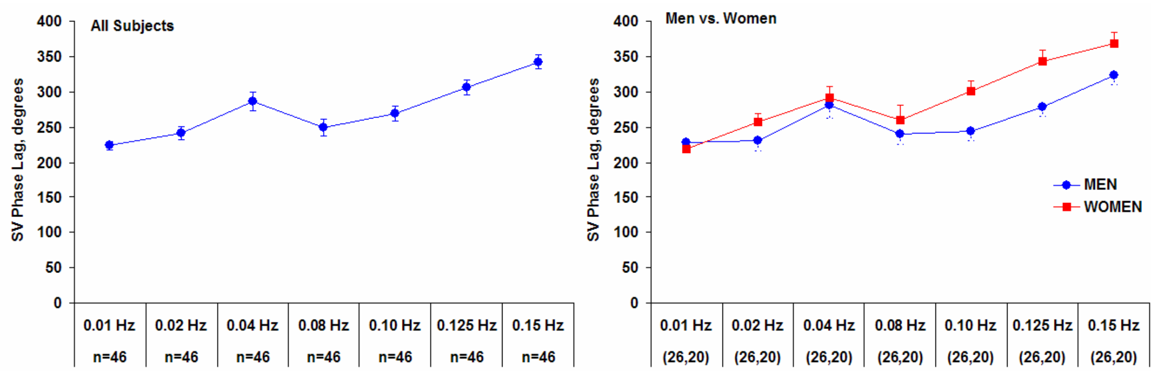

Figure 0.39: (a) SV phase lags averaged across all subjects and (b) by gender.

There was not an overall protocol or training effect, although there was an interaction term between training protocol and training day by input frequency (3 way interaction), Figure 4.40. The phase lag appears to reach a local maximum at 0.04 Hz in active subjects before and after training, as well as passive subjects before training; however, the phase response at 0.04 Hz after passive training is lower than those from these 3 groups.

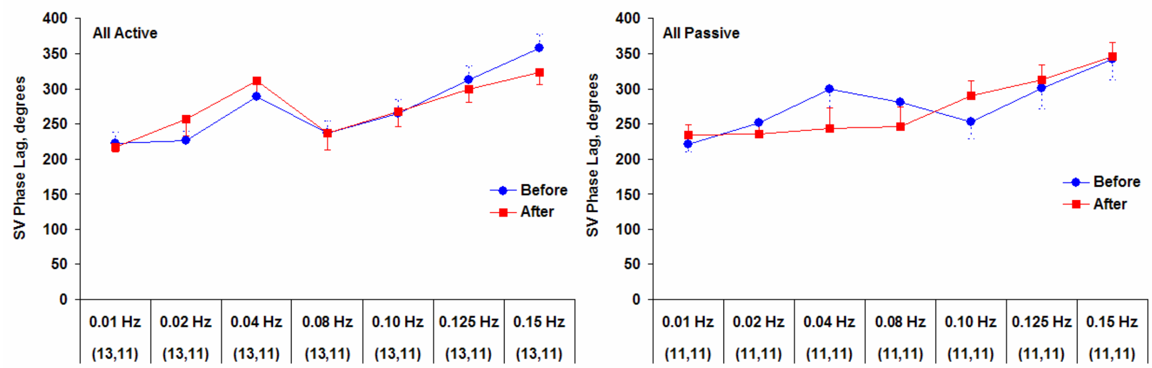

Figure 0.40: SV phase lags for active (a) and passive (b) subjects, before and after AG training.

Cardiac Output

Cardiac output amplitudes were not affected by input frequency, Figure 4.41. There were no differences in gender, training protocol or training day.

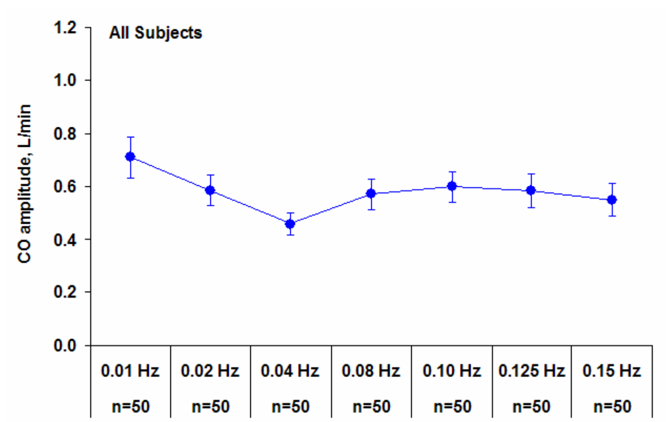

Figure 0.41: CO amplitudes averaged across all subjects.

Phase lag tended to increase with increasing LBNP input frequency, Figure 4.42a. Phase lag at 0.01 Hz was lower than at all other frequencies, and except for the decrease from 0.04 to 0.08 Hz, phase lag increased with each increase in input frequency from 0.02 to 0.15 Hz.

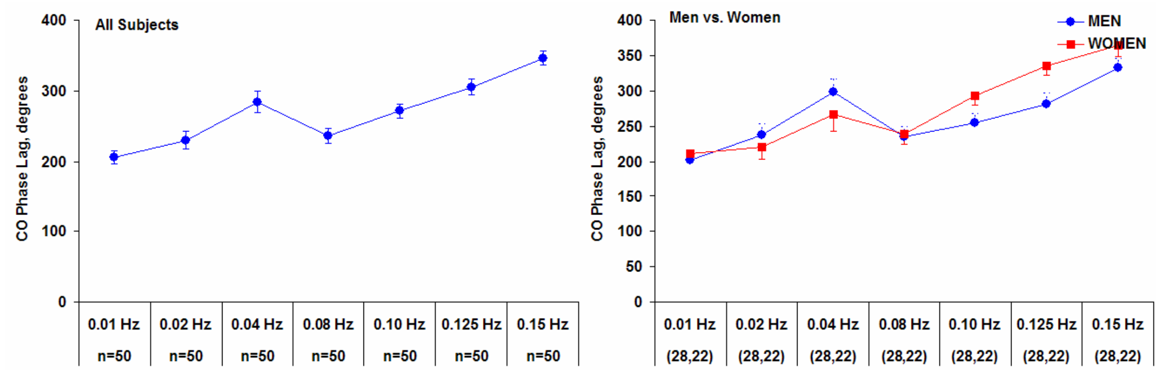

Figure 0.42: (a) CO phase lags averaged across all subjects and (b) separated by gender.

There was no phase difference between training groups, and no over all gender or training day effect, although there was a difference in the way men and women responded to various input frequencies, Figure 4.42b. Men increased phase lag from the slowest input to 0.02 Hz, while women's response was not different for the two slowest frequencies. This trend was similar at the two highest frequencies; women showed no difference, while men increased phase lag from 0.125 to 0.15 Hz.

End Diastolic Volume

The amplitude of the EDV response was higher for the 0.01 Hz input than for the next two (0.02 and 0.04 Hz) input frequencies, as well as the two fastest (0.125 and 0.15 Hz) frequencies, Figure 4.43. The amplitude response at 0.04 Hz was lower than that at 0.10 Hz.

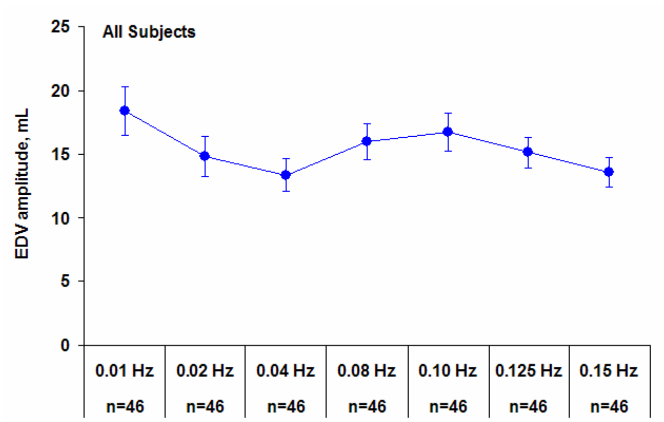

Figure 0.43: EDV amplitudes averaged across all subjects.

There was no difference in the EDV phase response to the 4 slowest input frequencies, although the phase at these 4 frequencies was significantly lower than each of the phase responses during the fastest three frequencies, Figure 4.44. The response of EDV to the LBNP input went farther out of phase for each increase in input frequency from 0.08 to 0.15 Hz (increase from 0.10 to 0.125 only marginally significant, p = 0.07). There were no differences in the EDV amplitude or phase response between gender, training group or tilt day.

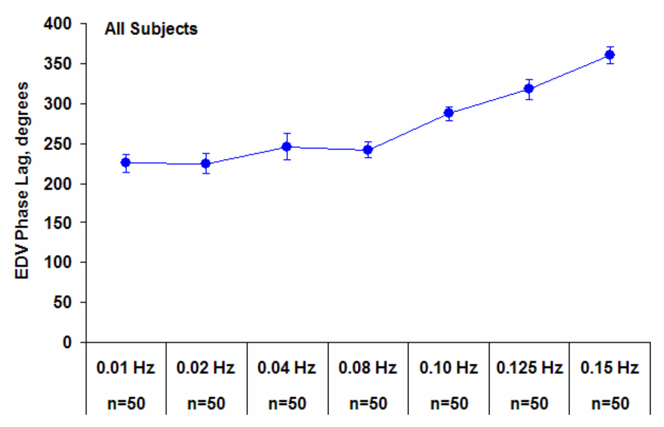

Figure 0.44: EDV phase lags averaged across all subjects.

Total Peripheral Resistance

The TPR amplitude response was independent of input frequency, but only marginally so (p = 0.0579, Figure 4.45a). There was no training protocol effect, or effect of tilt day, although there was a difference in gender; women had a higher TPR amplitude response than men, Figure 4.45b.

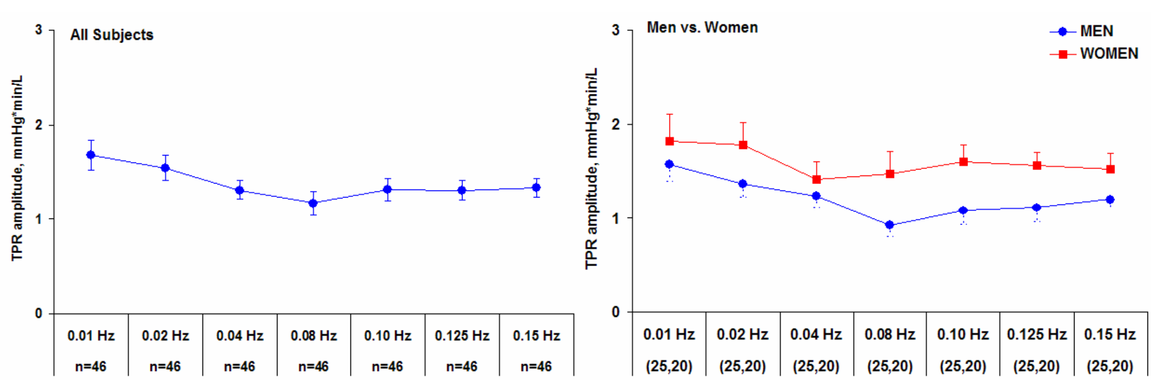

Figure 0.45: (a) TPR amplitudes averaged across all subjects and (b) separated by gender.

Although the TPR amplitude response was independent of input frequency, TPR phase lag increased with each increase in LBNP input frequency, Figure 4.46.

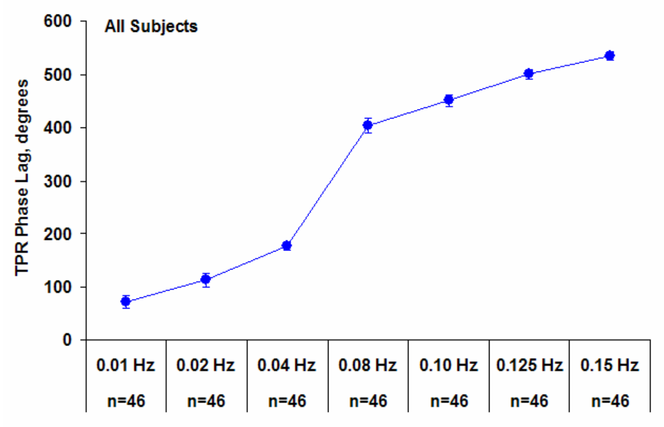

Figure 0.46: TPR phase lags averaged across all subjects.

There was no overall gender effect, training protocol or tilt day effect, although there was a protocol by day effect; active men had lower TPR phase lags after training, Figure 4.47a. Active men's phase lag after training was also lower than the phase lag of active women on both days (Figure 4.47c) and passive women on both days (Figure 4.47d). It was only marginally significantly lower than passive men after training (Figure 4.47b, $p = 0.071$).

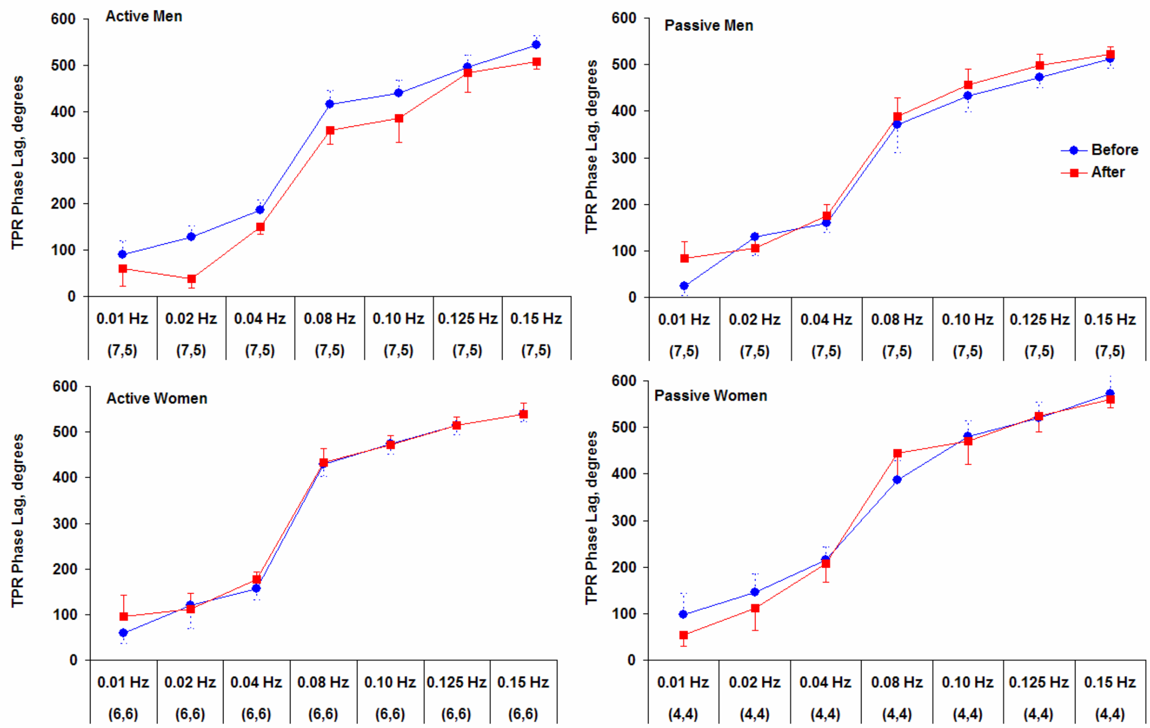

Figure 0.47: TPR phase lags, before and after training for active men (a, top left), passive men (b, top right), active women (c, bottom left) and passive women (d, bottom right).

Calf Circumference

Calf circumference amplitude decreased with increasing input frequency from 0.01 Hz to 0.08 Hz, but did not change from 0.08 Hz to 0.15 Hz, Figure 4.48a. Women had a lower amplitude response at 0.01 Hz than did men, Figure 4.48b. Women did not significantly decrease amplitude response from 0.01 to 0.02 Hz as did men, nor did they have any difference in amplitude response from 0.08 Hz to 0.15 Hz; men's amplitude response at 0.125 Hz was lower than at 0.08 Hz, and nearly significantly lower at 0.15 Hz (compared to 0.08 Hz, p = 0.065).

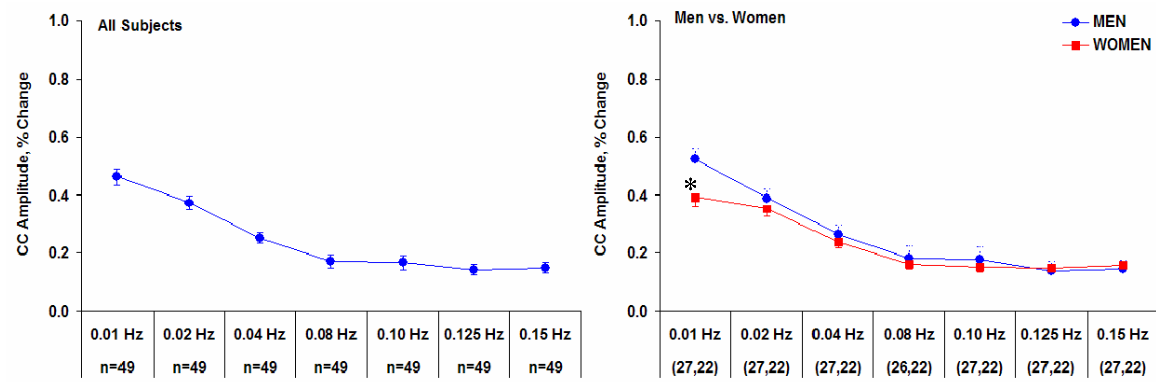

Figure 0.48: (a) CC amplitudes averaged across all subjects and (b) separated by gender. *Significant gender difference.

In contrast to the decreasing amplitude response of CC, phase lag increased with faster input frequencies from 0.02 Hz to 0.08 Hz, Figure 4.49. There was no phase difference from 0.08 Hz to 0.15 Hz.

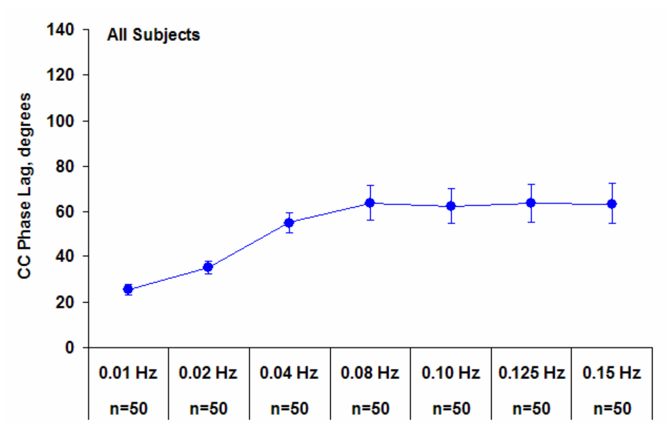

Figure 0.49: CC phase lags averaged across all subjects.

Active training tended to decrease phase lag (p = 0.09) while passive training appeared to have the opposite effect (NS, p = 0.25), Figure 4.50. There was a significant effect of training (decreased lag) in the active subjects at input frequencies of 0.10, 0.125 and 0.15 Hz, Figure 4.50a. Additionally, the phase response of active subjects after training was nearly independent of input frequency; other than the responses at 0.04 and 0.08 Hz, which were higher than at 0.01 Hz, there were no other statistical differences between any frequencies. The passive subjects, however, showed considerable changes with increasing input frequency after training, Figure 4.50b. Not only did the phase lag increase from 0.01 to 0.02 Hz, and 0.02 to 0.04 Hz, the phase lags at 0.01 and 0.02 Hz were lower than at all other frequencies, unlike the active subjects after training.

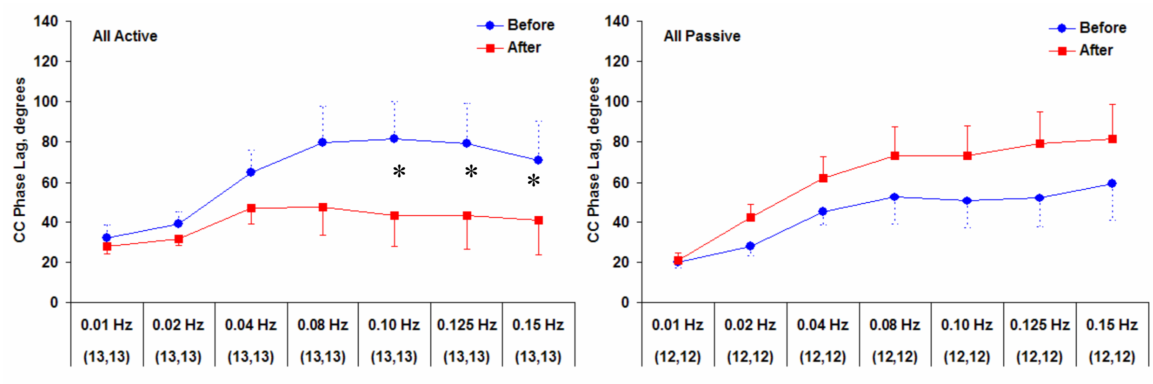

Figure 0.50: CC phase lags for (a) active and (b) passive subjects, before and after training. *Significant effect of training.

Baroreflex Analysis

Training

Baroreflex analysis was performed on only passive subjects during training. The data from the 1 Gz and 2.5 Gz segments were compared to data from supine control and 70° HUT for these same subjects. For both BRS and NNS, supine control and 1.0 Gz rotation were not significantly different from each other, nor were 2.5 Gz rotation and 70° HUT. However, both supine control and 1.0 Gz rotation were significantly different from both 2.5 Gz rotation and 70° HUT, Figure 4.51. There were no differences between gender, and no effect of training.

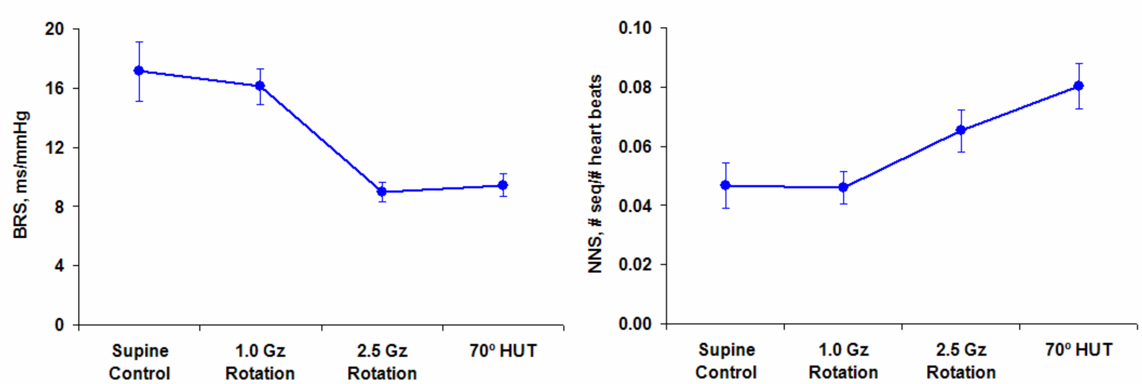

Figure 0.51: (a) Baroreflex sensitivity averaged across all passive subjects during artificial gravity training. (b) Normalized number of baroreflex sequences averaged across all passive subjects during artificial gravity training.

HUT/LBNP

The sensitivity of the baroreflex decreased from control to HUT, but did not change from HUT to -20 mmHg LBNP, nor from -20 mmHg LBNP to LST4, Figure 4.52a. The recovery value of BRS was higher than the other 4 segments. The normalized number of baroreflex sequences increased from control to HUT, then decreased from HUT to -20 mmHg LBNP, Figure 4.52b. The number of sequences during HUT was significantly higher than in all other segments.

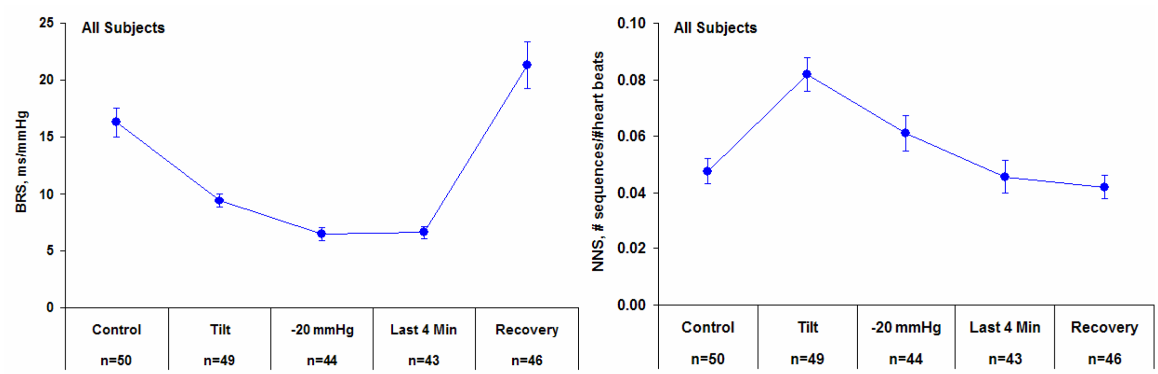

Figure 0.52: (a) Baroreflex sensitivity averaged across all subjects during HUT/LBNP test. (b) Normalized number of baroreflex sequences averaged across all subjects during HUT/LBNP test.

There were no differences between gender, training protocol, or as a result of training, although there was an interaction between protocol and day. Passive subjects had a lower number of sequences after training, Figure 4.53. Passive subjects before training did not have the decrease in sequences from HUT to -20 mmHg and LST4 that the other three groups (active before, active after, passive after) exhibited.

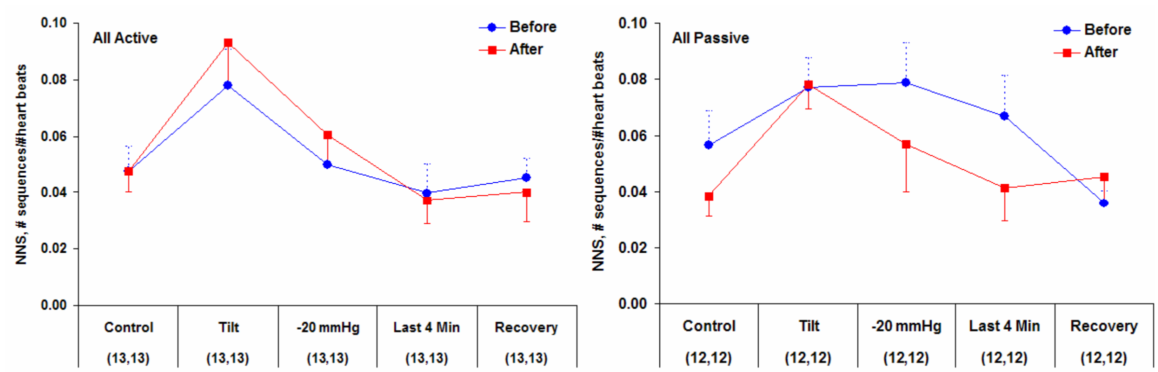

Figure 0.53: Normalized number of baroreflex sequences averaged for (a) active and (b) passive subjects, before and after training.

Blood Assay Results

Norepinephrine

Norepinephrine values increased with orthostatic stress, and then decreased during recovery; however, the recovery values were still higher than control values, Figure 4.54a. When compared by gender, men did not have the decrease in norepinephrine from -30 mmHg LBNP to recovery that women exhibited.

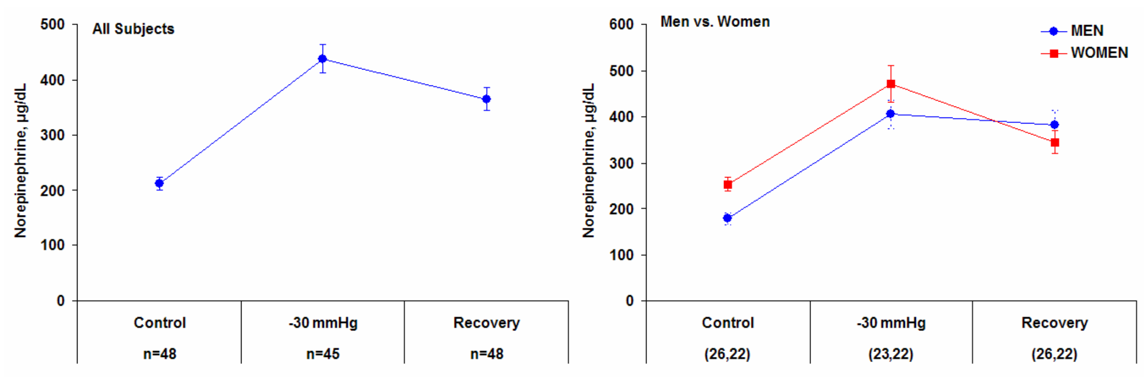

Figure 0.54: (a) Norepinephrine averaged across all subjects and (b) separated by gender.

Women had lower norepinephrine in recovery (compared to -30 mmHg LBNP) both before and after training, Figure 4.55. While not significant, men appeared to increase norepinephrine in recovery after training (men recovery, before vs. after, p = 0.077).

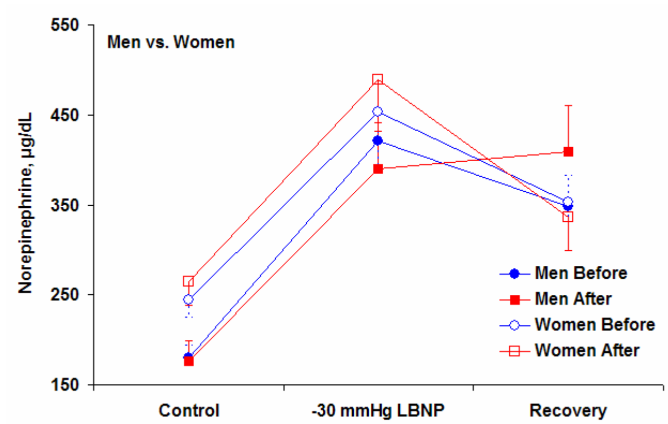

Figure 0.55: Norepinephrine before and after training by gender.

Epinephrine

Female epinephrine data were unavailable. Men increased epinephrine from control to HUT (plus -30 mmHg LBNP) and recovery, although there were no effects of training or training protocol, Figure 4.56.

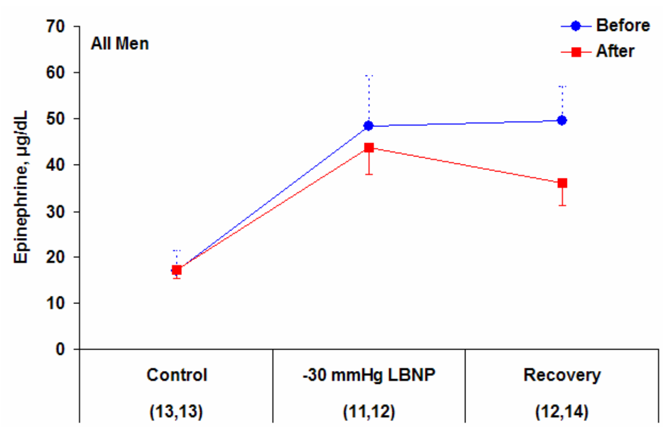

Figure 0.56: Epinephrine from men, before and after training.

Aldosterone

Aldosterone was higher in the third blood draw (at the time of pre-syncope) than during the first two blood draws, Figure 4.57. There were no differences in gender, or effects of training or training protocol.

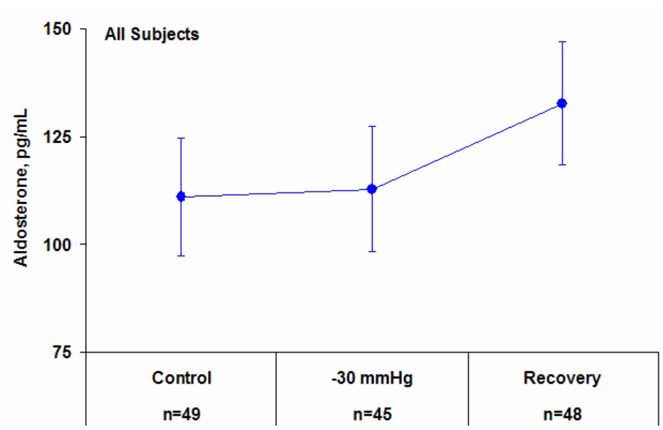

Figure 0.57: Aldosterone averaged across all subjects.

Plasma Renin Activity

Similar to aldosterone, plasma renin activity (PRA) was higher at pre-syncope than during control or HUT (plus -30 mmHg LBNP), Figure 4.58. There were no differences in gender, or effects of training or training protocol.

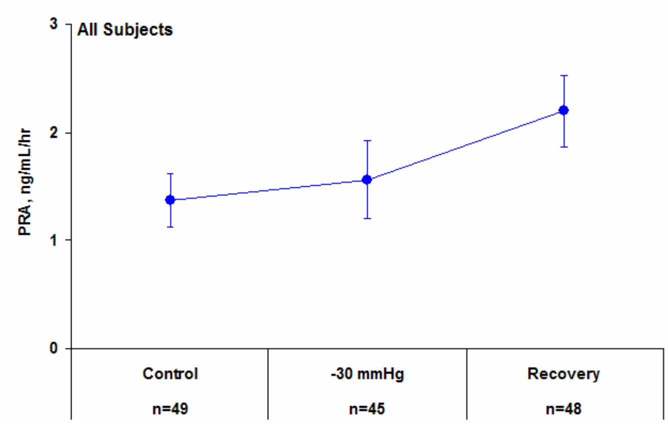

Figure 0.58: Plasma renin activity averaged across all subjects.

Total Protein

Total protein (TP) increased from control to HUT (plus -30 mmHg LBNP) to pre-syncope, Figure 4.59a. There were no effects of training or training protocol, although women did not increase TP from HUT (plus -30 mmHg LBNP) to pre-syncope, Figure 4.59b.

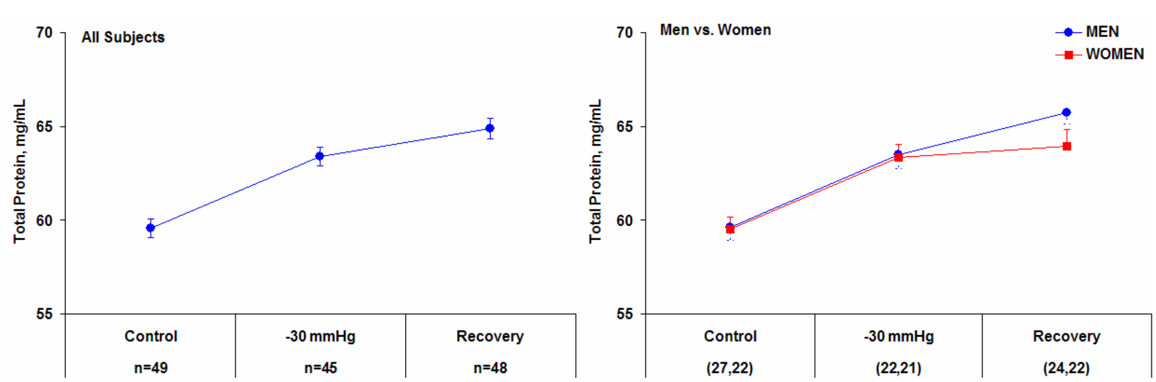

Figure 0.59: (a) Total protein averaged across all subjects, and (b) separated by gender.

Arginine Vasopressin

Arginine vasopressin (AVP) increased from blood draws #1 through #3 in men, but there were no changes in AVP in women with increasing orthostatic stress, Figure 4.60a. After training, men had the same control value of AVP, but did not increase AVP release with increasing orthostatic stress, Figure 4.60b.

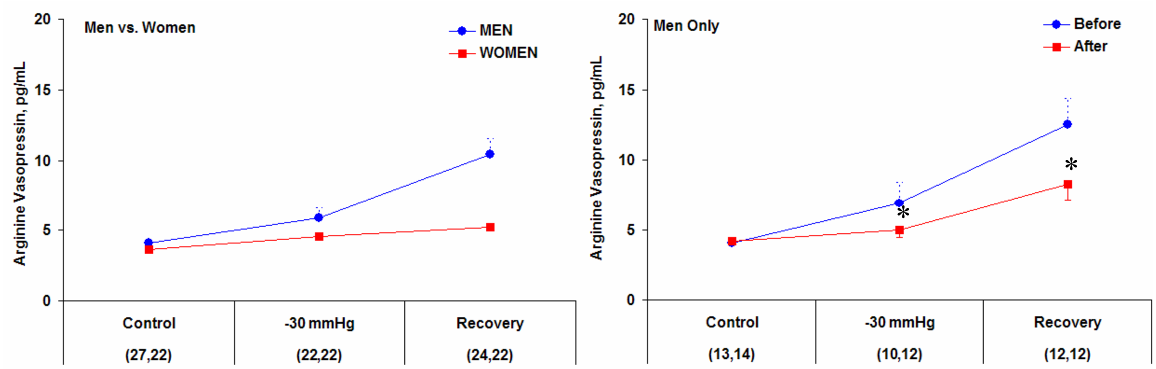

Figure 0.60: Arginine vasopressin for (a) men and women and (b) men, before and after training. *Significant effect of training.

Chapter 5: Discussion

Responses to HUT/LBNP

Orthostatic Tolerance

This research has shown that three weeks of intermittent artificial gravity training of 35 minutes a day is capable of improving orthostatic tolerance to a combination HUT/LBNP test for normal, ambulatory human subjects. Exercise accentuates artificial gravity training, evidenced by increased tolerance in both male and female active subjects, Figure 4.2. While this is the first study known to increase tolerance in normal, ambulatory subjects, exercise combined with AG training has been shown in the past to ameliorate the effects of simulated microgravity via dry water immersion (126, 127). Those studies used Gz exposures ranging from 0.8 to 2.0 Gz, from 40 minutes to a couple hours a day. Results from these water immersion studies indicate that artificial gravity training was optimal when exercise was coupled with centrifugation from 0.8 to 1.6 Gz, for 2 hours a day. Because our ambulatory subjects, especially those who exercised, showed improved tolerance after only 35 minutes a day of training, it is logical to hypothesize that this protocol would maintain or improve tolerance for subjects who have adapted to microgravity.

While there was no statistically significant improvement in our passive subjects, nor a significant difference between passive men and women, it appeared that there was a trend for artificial gravity training to improve tolerance in passive men, while slightly reducing tolerance in passive women, Figure 4.2. Other studies have shown improved cardiovascular function with artificial gravity alone (without exercise), but these studies did not test the effects of centrifugation on tolerance to an orthostatic stress (26, 75). Iwasaki et al reported two, 30-minute sessions a day, for four days, of short arm centrifugation prevented HDBR deconditioning effects on plasma volume and baroreflex function, but was unsuccessful in preventing loss of exercise capacity (75). These results, along with our findings, suggest that exercise is an important part of the artificial gravity countermeasure to orthostatic intolerance.

Although we were unable to measure work intensity via $MV0_2$ during our HPC training protocol, heart rate responses of active subjects during the ramp-up from 1 G_z to 2.5 G_z reached 185 ± 5 bpm which, along with the subject's assessment, indicated that these ramp-up periods required high intensity work. Therefore the active subjects received artificial gravity training via centrifugation, acute, high intensity exercise during Gz level increments, and moderate endurance exercise (average HR of 146 ± 6 bpm during the 2.5 G_z level). Acute, high intensity exercise alone near the end of a simulated microgravity study has been suggested to be effective in preventing the deconditioning effects of simulated microgravity and orthostatic intolerance (28, 29, 39). However, when used as a countermeasure during actual spaceflight, the response to the post-flight, standard stand test was no different in the exercise versus the control group (94). The addition of artificial gravity while exercising could help to prevent orthostatic intolerance in astronauts returning from space, but at present the technique has not been tried.

While the active female group improved tolerance after training, they were statistically less tolerant to HUT/LBNP than their male counterparts. This was true of the passive group as well—all men were more tolerant to HUT/LBNP than were women. This dichotomy was expected and has been well documented (23, 43, 45, 49, 93, 136, 139). This decreased tolerance to HUT/LBNP is most likely caused by increased pooling in the pelvic region in women (93, 139). It is encouraging that the active women in this protocol improved their tolerance to HUT/LBNP, and possible mechanisms for this improvement are discussed below.

Hemodynamic Responses

The hemodynamic responses to HUT were as expected; heart rate and vascular resistance increased concomitantly with a decrease in stroke volume, cardiac output and end diastolic volume, resulting in only minor changes in arterial pressure. It should be noted that the absolute values of cardiac output reported in this study are higher than values previously reported, although changes from baseline are within normal ranges.

Men responded to HUT and -20 mmHg LBNP by increasing blood pressure, while women decreased blood pressure in response to -20 mmHg LBNP. This drop in blood pressure when the vacuum was activated could be indicative of increased pooling in the splanchnic regions, which lie partially inside the vacuum chamber. Women also had a higher heart rate response to -20 mmHg LBNP than did men, although their supine control values were similar, indicating that their cardiovascular systems were more stressed at this early point in the HUT/LBNP test than were men's. This increase in heart rate without any changes in vascular resistance, suggests that women may respond to stress through vagal, rather than sympathetic mechanisms (23, 41, 49).

Artificial gravity training decreased arterial pressure, total peripheral resistance, and increased stroke volume for all subjects, and increased cardiac output in men. Men had a higher stroke volume and cardiac output than did women, although these gender differences disappear when values are normalized by body surface area. Increased cardiac output and stroke volume could be the result of increased circulating blood volume. While this variable was not measured in our study, other investigators have reported increased blood volume with high Gz training (26) and plasma volume restoration during HDBR with AG training (75). The decrease in mean TPR after training could have improved orthostatic tolerance via two mechanisms. First, a lower vascular resistance could indicate a greater "vasoconstrictor reserve," or the degree to which a subject can increase TPR to maintain blood pressure (51, 108). Results from this study (Figure 4.15) however, yielded diminished TPR during orthostatic stress, including at pre-syncope. If these subjects increase vasoconstrictor reserve capacity, they did not utilize it by increasing TPR near pre-syncope after training. Secondly, decreased arteriole resistance coupled with enhanced venomotor tone (not measured) could increase venous return which would increase cardiac output through increased stroke volume. Improved vascular function becomes very important when dealing with post-spaceflight orthostatic intolerance because one of the underlying mechanisms of this intolerance is diminished TPR response to tilt (7, 91, 92, 136).

Overall decreased TPR after training could partly be due to larger leg muscles (more vascular beds) after training, especially in the active subjects. Exercise training is well known to increase muscle size (102, 120, 121); in fact, in a nearly identical exercise with AG protocol, magnetic resonance imaging of the quadriceps showed significant volume (4% to 6% each, $p < 0.0001$) increase in all four muscles (57). We report a larger calf recovery volume after training in active subjects (Figure 4.17), with no change in passive men and a tendency for passive women to decrease CC_R after training ($p = 0.07$). This indicated that more fluid remained in the calf during recovery after training, even though the increase in calf size during maximal stress was not different (no increase in CC_T). This suggests that the active subjects had larger calf sizes before the onset of HUT/LBNP after training, and the same relative increase in CC (no change in CC_T) yielded a larger pooling of fluid in the calf (larger CC_R).

Increased resting vasodilation after training could be the result of increased shear-mediated nitric oxide (NO) activity. Exercise training has been shown to increase NO function, a result of increased flow in the legs due to metabolic demands of exercising muscle (56). It is probable that our centrifuge training protocol accentuates this effect by increasing fluid shifts to the lower legs. However, this shifting of fluid to the legs via short arm centrifugation has been shown to reduce cutaneous blood flow in the legs, most likely through peripheral vasoconstriction caused by unloading of baroreceptors (132). Therefore, during training, a local autacoid-mediated dilation could counteract extrinsic sympathetically-driven constriction. It is possible that the magnitude of these opposing mechanisms during hypergravity helped to improve tolerance to orthostatic stress.

The above argument is not as persuasive when considering female subjects. Active women did have a larger CC_R, however, they did not show a decrease in TPR after training, Figure 4.15. It is important to note that active women already had low mean TPR values *before* training that were already as low as those reached by the other three groups *after* training (active women *before* < passive women before and after, $p = 0.0175$, and not significantly different from both male groups *after* training). These subjects may have had lower TPR before training due to 1) circulating estrogen (129, 143) (this does not explain the difference between female groups) and 2) even though an effort was made to randomize these female subjects, at baseline the active women were more athletic than their passive counterparts.

Neurohumoral Responses

The neurohumoral responses to orthostatic stress reported in this study are similar to those reported previously (77). As expected, norepinephrine and epinephrine were enhanced during the second blood draw (during HUT with -30 mmHg LBNP).

Aldosterone and PRA were not significantly enhanced until the 3rd blood draw (at the point of pre-syncope).

Total protein concentrations increased with increasing orthostatic stress, which is indicative of fluid filtration out of the vascular system. Women did not have a significant increase in TP concentration from blood draw #2 to #3. This is most likely due to the small amount of time between these blood draws for women. Because women developed presyncopal symptoms near the time of the second blood draw, the pre-syncopal (3rd draw) blood draw often occurred right after (usually within 2 minutes) this second blood draw. Men have a larger TP concentration at the time of their pre-syncopal blood draw because they were able to withstand a longer stress, allowing for more fluid filtration.

Arginine vasopressin increased with increasing orthostatic stress in men (although these small changes were not large enough to impact blood pressure regulation), but did not change in women. Also, men had higher levels of AVP than did women. This has been supported by other researchers (74, 114), and an inability of women to rely on AVP response to orthostatic stress might be one of the factors involved in their overall reduced tolerance to LBNP. Men had smaller AVP responses to stress after AG training, although their control values were not different. This could be evidence that AG-trained men relied more on neurally-mediated peripheral vascular responses to maintain tolerance rather than through neurohumoral responses.

Spectral Power

Low frequency (0.04 – 0.15 Hz) spectral power of blood pressure increased in all subjects in response to orthostatic stress (control and recovery < HUT < -20 mmHg LBNP and LST4), Figure 4.18. This was an expected result, indicating increased sympathetic nervous system activity with the onset of orthostatic stress. Low frequency oscillations in arterial pressure and RR interval have been directly correlated to oscillations in sympathetic nerve discharge (52, 98). In our study, this index of increased sympathetic activity was supported by increased circulating norepinephrine in all subjects during blood draws at -30 mmHg LBNP and ninety seconds after presyncopal symptoms developed, and increased epinephrine in all male subjects (female epinephrine data was unavailable).

These low frequency oscillations in blood pressure are most likely caused by low frequency oscillations in vascular resistance (78, 115, 116). This study showed increased LF TPR spectral power during all levels of orthostatic stress (HUT, -20 mmHg LBNP, LST4) compared to supine control and recovery. Women had a higher LF TPR response to HUT than did men *after* training, indicating that women had higher sympathetic regulation of blood pressure after AG training. This higher LF TPR response to HUT was present in both female groups, and did not differentiate between active and passive subjects. In active women, there was no change in mean TPR after training, unlike the other training groups, indicating that enhanced vasomotion may have played some role in improving tolerance to HUT in active women.

Another index of autonomic regulation is high frequency (0.15 – 0.40 Hz) spectral power of heart rate and blood pressure. In contrast to LF power, a *decrease* in HF power has been shown to correlate with decreased parasympathetic outflow (52). This is seen in the current group of subjects as a decrease in HF heart rate power during -20 mmHg LBNP and LST4, compared to supine control and recovery, Figure 4.22a. Women had significantly higher HF arterial pressure power and nearly higher heart rate HF power than men ($p = 0.07$, Figure 4.22b). Increased AP high frequency power could be a direct effect of breathing (106) and higher HR HF could indicate that women had greater vagal, rather than sympathetic, control of heart rate. This is not an uncommon finding, and has been suggested by several researchers (23, 41, 49). Additionally, women decreased HF arterial pressure power after training, perhaps indicating higher sympathetic control of blood pressure. Changes in HF arterial pressure power coupled with a HUT-induced increase in LF TPR power after training suggests that female subjects may have responded to AG training by increasing sympathetic regulation of blood pressure, with less reliance on parasympathetic control. Overall, however, women had a higher index of parasympathetic control (HF heart rate), which is probably one of the reasons they have overall less tolerance to orthostatic stress than do men (49).

Baroreflex Activity

Analysis of the cardiac baroreflex response before and after training, as well as during training, also provides insight into the effects of artificial gravity training on cardiovascular responses to orthostatic stress. Decreases in baroreflex sensitivity and increases in the normalized number of sequences from supine control to head-up tilt were expected, and are well documented (4, 72, 73, 117). However, there were no differences in BRS or NNS between supine control (0 G_z) and supine 1 G_z rotation. This implies that 1 G_z rotation does not stimulate carotid or aortic baroreceptors above the level of that measured for supine control. Rotation producing 2.5 G_z at the feet was required to shift enough fluid to unload cardiac baroreceptors in order to stimulate a response equivalent to 70° HUT. Watenpaugh et al suggested that (on a 1.8 m centrifuge), 5 G_z might be needed at the feet to elicit a response similar to standing (132), but the present study verified that 2.5 G_z on a 1.9 m centrifuge was sufficient to accomplish this.

There was some variability associated with subject's heights; however, in general 1.0 G_z at the feet is approximately 0.2 to 0.25 G_z at the heart level, and even smaller at the carotid baroreceptors. Similarly, 2.5 G_z acceleration at the feet does not produce 1.0 G_z at the heart; it is approximately 0.7 to 0.75 G_z at the heart. Based on these physical calculations alone, one would not expect 2.5 G_z (at the feet) acceleration to stimulate the cardiac baroreceptors as much as 70° HUT ($\sin 70° * 1G_z \approx 0.94\ G_z$), yet our spontaneous baroreflex analysis would suggest otherwise. This could be caused by indirect unloading of the baroreceptors by fluid sequestering in the legs due to the 2.5 G_z at the feet. Although the gravity gradient along the body is linearly related to radial distance from the center of centrifugation, the hydrostatic gradient is non-linear ($\omega^2 r^2$ as opposed to $\omega^2 r$). This causes a large shift of fluid to the feet, which could unload the baroreceptors and explain the similarity in baroreflex responses at supine 2.5 G_z and 70° HUT.

It is possible that these AG training-induced shifts of fluid to the feet stimulate cardiopulmonary baroreceptors more than aortic or cardiac baroreceptors. These low-pressure receptors act mainly through sympathetic stimulation of the vasculature (105), which might explain the enhanced vascular resistance responses seen in our active subjects after training.

Responses to OLBNP

One of the "regulated" variables during cardiovascular stress is blood pressure. Previous studies analyzing the control of blood pressure in dogs exposed to sinusoidal acceleration at frequencies similar to this study indicated that AP was centrally regulated at very low frequencies (below 0.012 Hz), and that these central mechanisms were less effective at higher frequencies (82, 103). More recent human studies using oscillatory lower body negative pressure yielded similar results (88). Brown et al determined that cerebral blood vessels were unable to modulate fluctuations in arterial pressure (in response to OLBNP), and that this effect was more pronounced at higher frequencies . Levenhagen et al determined in a similar group of ambulatory men, that arterial pressure fluctuations were minimized at all OLNBP input frequencies. However, when the amplitude of arterial pressure oscillations were normalized by the amplitude of fluid volume shifted (either calf circumference or central venous pressure oscillations), AP amplitudes increased with increasing input frequencies, peaking at 0.08 Hz (88).

Similar to Levenhagen et al, our results show relatively stable (<3 mmHg) AP amplitudes across the range of input OLBNP frequencies. Amplitudes at 0.10 and 0.125 Hz were slightly lower than at 0.01 Hz, indicating either smaller volume of fluid was being shifted or enhanced regulation occurred at higher frequencies. In the present study, the largest amplitude responses occurred at 0.04 Hz and this could be the effect of TPR timing in response to OLBNP—both AP and TPR were in phase at this frequency, meaning maximum vasoconstriction was occurring in sync with maximum blood pressure, which could yield larger oscillations in AP (Figures 4.32 and 4.46). Also similar to Levenhagen, normalization of AP amplitudes with changes in CC indicated reduced control of blood pressure at higher input frequencies, Figure 5.1. Overall, our results support the concept that healthy, ambulatory subjects regulated blood pressure quite well in spite of large oscillations in cardiac output at lower frequencies and reduced control at higher frequencies, where smaller oscillations in fluid volume appear to be the principal factor.

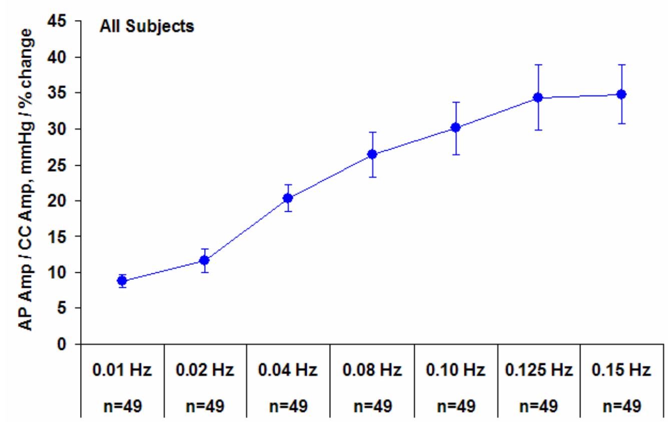

Figure 0.1: AP amplitudes normalized by CC amplitudes for all subjects.

The phase response of AP was also similar to the human OLBNP study (88). Arterial pressure consistently lagged OLBNP input by approximately 180^{o}, except at 0.08 Hz, where it was about 210^{o} out of phase. This indicated that blood pressure fell as vacuum was applied, as would be expected.

Levenhagen et al reported decreasing HR amplitudes with increasing OLBNP input frequencies. This study yielded similar results from 0.01 to 0.04 Hz, with no changes in amplitude response at higher input frequencies. It is important to note, however, that this study analyzed frequencies higher than those used by Levenhagen et al (0.125 and 0.15 Hz), and no predictions can be made about trends from their data past 0.10 Hz. This decrease in amplitude with increasing frequency has been suggested as a decrease in central neural control; current results (no change in HR amplitude from 0.04 to 0.15 Hz) suggest no change in neural control, possibly due to the minimal fluid shifts at higher input frequencies. However, examination of the HR phase response suggests that HR is responding as needed; even though phase lags were larger at faster input frequencies, the actual response time of maximum HR to the maximum pull of OLBNP at the 4 fastest frequencies averaged 5 seconds, which is faster than the HR responses to input frequencies from 0.01 to 0.04 Hz. Another interesting observation from timing data (as opposed to phase lags in degrees) is that men had a significantly slower HR response to OLBNP input than do women (Figure 5.2), implying that heart rate (known to be capable of reflex changes in a second) was actually participating in blood pressure regulation by buffering other variables that were slower to act in men than in women.

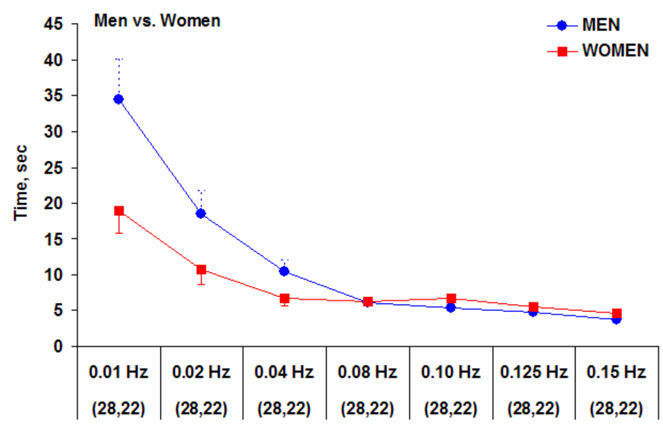

Figure 0.2: Heart response time to OLBNP input for men and women

This difference in HR response times in men and women was a main effect of the ANOVA, but it can be seen that this is an effect of the low frequency (0.01 – 0.04 Hz) inputs. This is another indication that women respond more vagally than do men, or, possibly that women were more stressed than men were at these low LBNP frequencies. It is possible that women were more stressed at these low LBNP input frequencies, as active women had larger blood pressure oscillations at 0.04 Hz than did active men, and passive women had larger blood pressure oscillations at 0.01 Hz than did passive men, Figure 4.31b. An interesting corollary to this difference in HR timing is the timing response of TPR to OLBNP, Figure 5.3. Although not statistically significant, there is a trend for male TPR responses to be faster than female responses, again suggesting that men have a stronger (faster) sympathetic response to stress than do women. However, women had larger TPR amplitude response than did men at all frequencies (Figure 4.45b); this might be interpreted as women having larger sympathetic responses, or more likely that women were being stressed more severely during LBNP than were men (93, 138, 139).

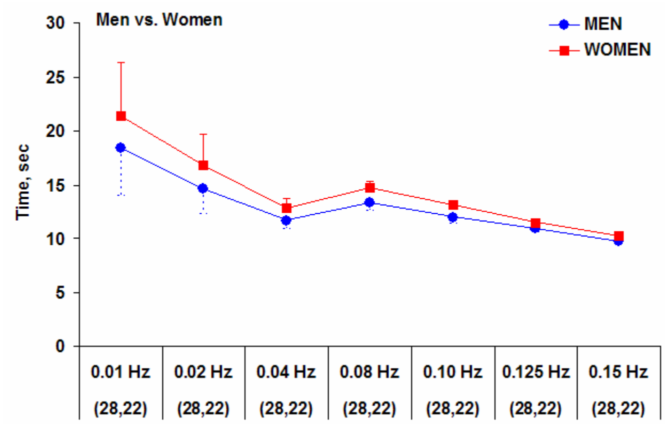

Figure 0.3: TPR timing response to OLBNP input for men and women.

The forcing function used in this test was oscillatory lower body negative pressure; however, in response to OLBNP, the perturbation to the cardiovascular system is actually shifting of fluid from the upper body to the lower body. In this study, an index of this shift is a change in calf circumference. Slower input frequencies allow more time for fluid to accumulate in the calf, and this is seen in the larger amplitude responses at lower input frequencies, Figure 4.48a. As input frequency increased, CC amplitude decreased from 0.01 to 0.08 Hz, as there was less time for fluid to build up in the calf. From 0.08 to 0.15 Hz, there was no change in the amplitude response of CC, indicating no difference in pooling in the lower leg during these frequencies. Swelling of the calf during short-term (less than 10 minutes) LBNP appeared to be dominated by shifting of fluid to venous spaces (2, 8), and not likely caused by filtration into interstitial spaces. However, the results from the present study indicate a difference in the amount of blood pooled at low versus high input frequencies. It is possible that filtration into interstitial places may contribute to the amount of fluid shifted for frequencies below 0.08 Hz (period of 12 seconds), which accounts for the larger changes in CC at lower than 0.08 Hz input frequencies; at higher frequencies, it is likely that a significant amount of filtration does not occur within 6 to 12 seconds of LBNP (0.15 to 0.08 Hz), which could explain why CC amplitudes do not further change with increasing frequencies above 0.08 Hz.

As OLBNP input frequency increased from 0.01 to 0.08 Hz, CC tended to fall farther out of phase (Figure 4.49) while, from 0.08 to 0.15 Hz, there was no change in CC phase lag with respect to input frequency. However, a steady phase response to increasing frequency indicates a decrease in timing in the time domain. Although there were no amplitude or phase changes in input frequencies from 0.08 Hz to 0.15 Hz, the calf circumference changes faster in response to faster input frequency, indicating that vascular fluid shifts keep up with the OLBNP stimulus.

After active training, phase lag tended to be diminished ($p = 0.09$ overall, $p < 0.05$ for 0.08, 0.10 and 0.125 Hz inputs, Figure 4.50a). Although not a significant effect, the passive subjects responded in an opposite fashion, tending to increase phase lag after training, Figure 4.50b. This increased speed of response after active training could imply increased vascular compliance, yielding a larger change in volume for smaller pressure changes (thereby making the calf swell faster with the onset of LBNP); or decreased CC response time could be the effect of a larger vascular bed (large muscles) after active training. A larger vascular bed might be construed to be detrimental to maintaining orthostatic tolerance, but other results indicate a positive effect of training. For example, active men significantly reduced TPR phase lag (at all input frequencies) after training, indicating enhanced responsiveness to OLBNP.

One could argue that the increased response time of TPR after training is simply a response to faster changes in CC dynamics; however, this is not the case. By subtracting CC phase values from TPR phase, one can calculate the vascular resistance response to shifting of fluid to the calf. In doing this, the active men significantly decreased ($p = 0.01$) TPR response time to changes in CC, while active women significantly increased ($p = 0.02$) TPR response time to changes in CC after training, Figure 5.4.

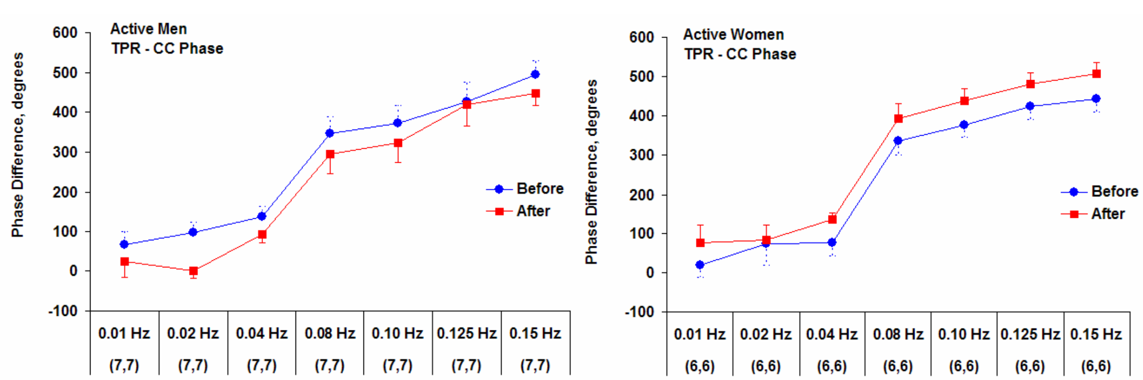

Figure 0.4: TPR phase response to changes in CC for active men (left) and women (right), before and after AG training.

While not significant (p = 0.08), women's TPR response to CC changes tended to be slower than men's. This slower TPR response to CC changes is independent of training, and could be a reason for decreased orthostatic tolerance in women. As stated above, a predominance of literature indicates that men's cardiovascular control is sympathetically dominated, while women respond more vagally. With these findings in mind, comparisons of response times of both TPR and HR to changes in AP were made. Similar to the response to changes in CC, TPR responded faster to changes in AP after training than before in active men (p = 0.02). There were no differences in TPR response times to AP changes in women, although passive men *increased* TPR response time (slower responses) to changes in AP. If the vascular resistance response to changes in AP is an indicator of training efficacy, then this is strong evidence that exercise is an important aspect of AG training in men.

Unlike the increased responsiveness of TPR to AP changes, HR responses to changes in AP were more sluggish after training (in all subjects), Figure 5.5.

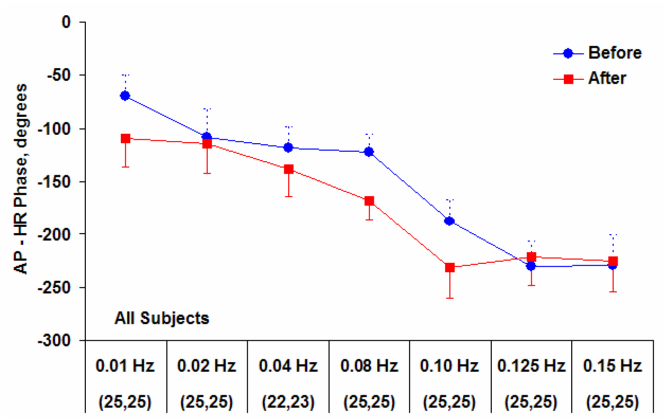

Figure 0.5: Heart rate responses to changs in blood pressure before (blue) and after (red) training for all subjects.

This could be a result of the 'decoupling' effect of AG training – improved tolerance via peripheral mechanisms without improvement in cardiac baroreflex (discussed below) responses. The increased response time (slower response) of HR to changes in AP was associated with a decrease in HR amplitude at 0.01 Hz for all active subjects after training, Figure 4.35a. Although there was no effect of training or gender, 0.01 Hz was the only frequency at which OLBNP induced a faster response in TPR than in HR. It could be that the body chooses to respond to disturbances in AP via vascular mechanisms, but is unable to do so at higher frequencies.

These TPR and HR results are opposite of those found by Charles, in which oscillatory fluid shifts via centrifugation were assessed in two groups (endurance exercised trained versus control) chronically instrumented dogs (18). The conclusions from this dog study were that endurance trained dogs had *slower* TPR responses after training, and these endurance trained dogs relied more on HR to buffer changes in blood pressure. The differences between these two studies could be a result of: 1) species, Charles studied dogs rather than humans, 2) stimulus, Charles used acceleration on a centrifuge to cause fluid shifts while this study used LBNP and 3) training paradigm, the endurance trained dogs in Charles' study were trained in a normal 1 G_z environment (treadmill at a 10º incline) while the active men in the present study were trained in an oscillatory, but rotational G_z environment.

Limitations

Although this study was able to show that artificial gravity training was beneficial in improving orthostatic tolerance in normal, ambulatory subjects, the subject pool was not controlled in any way. Subjects arrived daily for their training session, then resumed their normal lives, so strict experimental control of subjects was not maintained. Secondly, MV02 was not assessed, so, even though subjects and input loads were matched to that of the 1999 study where this assessment was made, heart rate reached during the effort to drive the centrifuge was our only direct assessment of how hard each subject was working. Thirdly, even though subjects were randomly assigned to groups, the active female group was more athletic and "in shape" then were the passive females.

Our HUT/LBNP termination point was subject to a large number of factors, including drops in blood pressure and heart rate, as well several measures of subject discomfort; stomach awareness, light-headedness, sweating or general discomfort. While the same medical monitor was used for the duration of the study, so that the same pre-syncopal symptoms were identified both before and training, fewer than half the subjects did not exhibit the classic drops in blood pressure and heart rate associated with vasovagal syncope, but for other reasons mentioned above the test was terminated. .

Another limitation of this study was a lack of plasma volume measurements. Other studies have showed changes in plasma and/or blood volumes associated with centrifuge studying, and it is unclear if these volume changes are associated with improved tolerance. Additionally, women's epinephrine and dopamine data were contaminated during analysis, and were not suitable for use in this document.

Finally, there are some aspects of blood pressure regulation that may have been effected by AG training which were not measured in this study. For example, improved orthostatic tolerance may have been the result of enhanced cerebral autoregulation (148), although much of the evidence in this study points peripheral vasculature mechanisms.

Chapter 6: Conclusions

The hypothesis of this study was that 3 weeks of artificial gravity training would improve orthostatic tolerance in normal, ambulatory subjects. The results of this study indicated that this hypothesis was correct; three weeks of training improved orthostatic tolerance by 13% in a group of 26 subjects. Men were more tolerant to orthostatic stress than were women, both before and after training and men had higher blood pressure, stroke volume, end diastolic volume and cardiac output than did women Active subjects, regardless of gender, were more improved than their passive counterparts.

Improved tolerance (of the whole group of subjects) was associated with decreased blood pressure and total peripheral resistance after training, as well as increased stroke volume. Improved tolerance in active subjects was associated with larger residual calf circumferences during recovery after training, as well as faster CC and TPR responses to OLBNP input after training. After training, all subjects had slower HR responses to changes in AP.

These mechanisms associated with improved tolerance are not a result of increased cardiac baroreflex activity, as there were no BRS or NNS changes post-training. Also, spontaneous baroreflex analysis yielded no differences between supine control and supine 1.0 G_z acceleration, nor between 70^o HUT and 2.5 G_z acceleration, suggesting that mechanisms other than centrally mediated cardiac baroreflex are responsible for any artificial gravity training effects.

Chapter 7: Future Work

While this study was successful in improving orthostatic tolerance in normal, ambulatory subjects, the impetus behind this research was development of a countermeasure to orthostatic intolerance associated with cardiovascular deconditioning in spaceflight. A well documented analog of cardiovascular alterations to microgravity is extended bed rest in a 6^{o} head down position. Future research should be performed to assess the efficacy of artificial gravity training in preventing any detrimental effects associated with these adaptations to microgravity.

Additionally, duration, frequency and intensity of AG training needs to be examined in order to determine the best combination of exercise and AG training for its use a practical countermeasure. In optimizing these parameters, new methods of analysis should be utilized to determine the effects of AG training. Specifically, segmental body impedance should be used to assess fluid volume shifts not only during a provocative HUT/LBNP test, but also *during* AG training. This type of analysis would help to answer previously unexplored aspects of AG training, such as volume changes in different regions of the body under varying levels of AG and exercise.

Appendices

Appendix A: Subject and Data File information

Table 1: Anthropomorphic Data for All Subjects

	Gender	Training Group	Age (yr)	Height (cm)	Weight (kg)
A	male	active	24	180	82
B	male	passive	37	182	73
C	male	passive	50	180	100
D	male	active	37	184	71
E	male	passive	34	178	80
F	male	passive	34	173	72
G	male	active	34	187	86
H	male	passive	30	155	77
I	male	active	29	183	84
J	male	active	46	170	73
K	male	active	21	173	82
L	male	active	29	188	89
M	male	passive	32	176	78
N	male	passive	26	180	82
O	male	passive	27	188	90
AW	female	passive	37	163	62
BW	female	passive	29	171	57
CW	female	active	35	172	60
DW	female	passive	28	164	52
EW	female	active	25	159	58
FW	female	passive	39	164	56
GW	female	active	29	184	65
HW	female	active	22	169	61
IW	female	passive	27	158	72
JW	female	passive	26	147	51
KW	female	active	31	170	62
LW	female	active	34	142	83
MW	female	passive	28	159	55
NW	female	active	44	168	71

Table 2: Channel Assignments for Data Processing

Channel	Variable
1	Arterial Pressure
2	Systolic Pressure
3	Diastolic Pressure
4	Mean Arterial Pressure
5	ECG
6	Heart Rate
7	RR Interval
8	Stroke Volume
9	Cardiac Output
10	End Diastolic Volume
11	Thoracic Fluid Index
12	Calf Circumference
13	Tilt Angle
14	LBNP Level
15	Palm Skin Perfusion
16	Forearm Skin Perfusion
17	Palm Skin Velocity
18	Forearm Skin Velocity
19	Palm CMBC
20	Forearm CMBC
21	Total Peripheral Resistance

Appendix B: Statistics Code

Example SAS code to calculate 4 factor ANOVA

```
**************************************************;
* two within and two between subjects factors;
**************************************************;
options ls=200 ps=10000 nonumber nodate;
data one;
input id $ y1-y7;
line + 1;
gender = ' MEN ';
if line > 28 then gender = 'WOMEN';
protocol = 'ACTIVE ';
if line > 14 then protocol = 'PASSIVE';
if line > 28 then protocol = 'ACTIVE ';
if line > 40 then protocol = 'PASSIVE';
day = ' BEFORE';
if line > 7 then day = ' AFTER ';
if line > 14 then day = ' BEFORE';
if line > 21 then day = ' AFTER ';
if line > 28 then day = ' BEFORE';
if line > 34 then day = ' AFTER ';
if line > 40 then day = ' BEFORE';
if line > 45 then day = ' AFTER ';
id_m=substr(id,1,4);
cards;

DATA GOES HERE.

;
run;

proc print data=one;
*var gender day id y1-y7;
title OLBNP Analysis;
run;

data two;
set one;
seg = '0.010Hz'; y = y1; output;
seg = '0.020Hz'; y = y2; output;
seg = '0.040Hz'; y = y3; output;
seg = '0.080Hz'; y = y4; output;
seg = '0.100Hz'; y = y5; output;
seg = '0.125Hz'; y = y6; output;
seg = '0.150Hz'; y = y7; output;
run;
proc means data=two n mean std stderr noprint;
class gender day protocol seg;
var y;
output out=two_means n=n mean=y_mean std=y_sd stderr=y_sem;
title 'mean responses by each treatment combination';
run;
proc print data=two_means noobs;
```

```
where gender ne ' ' and day ne ' ' and protocol ne ' ' and seg ne ' ';
var gender day protocol seg n y_mean y_sd y_sem;
run;

proc mixed data=two covtest;
class gender day protocol seg id_m;
model y = gender| day| protocol| seg / ddfm = satterth ;
random id_m(gender*protocol) seg*id_m(gender*protocol)
        day*id_m(gender*protocol);
title 'mixed linear model';
run;
```

Appendix C: Mean and Spectral Power Data Results for HUT/LBNP Data

Table 3: Arterial Pressure Means (mmHg)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	112.00	128.00	129.00	127.00	122.00	115.00	.	118.00	110.00
D_HPB	89.00	105.00	106.00	104.00	.	.	.	105.00	92.40
G_HPB	124.00	117.00	112.00	113.00	116.00	118.00	117.00	117.00	119.00
I_HPB	80.00	112.00	76.00	.	.	.	.	79.50	73.60
J_HPB	108.00	113.00	113.00	121.00	.	.	.	115.00	128.00
K_HPB	97.60	116.00	109.00	.	.	.	.	110.00	94.20
L_HPB	111.00	112.00	99.10	.	.	.	.	104.00	108.00
N	7	7	7	4	2	2	1	7	7
AVG	103.08571	114.71429	106.3	116.25	119	116.5	117	106.92857	103.6
SEM	5.7011038	2.6521715	6.1139575	4.9895725	3	1.5	#DIV/0!	5.0313642	6.9121012

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	84.29	81.78	.	.	.	102.12	.	102.12	97.39
D_HPA	89.00	105.00	106.00	104.00	.	.	.	105.00	92.40
G_HPA	111.00	109.00	105.00	109.00	108.00	108.00	109.00	108.00	116.00
I_HPA	79.70	91.60	91.30	89.90	.	.	.	90.20	75.30
J_HPA	92.00	98.10	94.80	97.80	95.10	88.80	.	91.60	99.10
K_HPA	102.00	108.00	106.00	101.00	.	.	.	103.00	104.00
L_HPA	110.00	108.00	98.70	.	.	.	.	101.00	107.00
N	7	7	6	5	2	3	1	7	7
AVG	95.427749	100.21151	100.3	100.34	101.55	99.638783	109	100.13091	98.740745
SEM	4.6864101	3.9030036	2.587663	3.1958723	6.45	5.6793119	#DIV/0!	2.5352702	4.8437418

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	99.10	104.00	106.00	112.00	.	.	.	112.00	94.20
C_PSB	113.00	136.00	132.00	129.00	119.00	108.00	82.80	90.90	99.20
E_PSB	96.50	96.90	91.20	91.40	84.80	.	.	87.00	95.10
F_PSB	90.40	86.50	76.40	71.40	.	.	.	72.90	101.00
M_PSB	82.40	86.00	80.40	.	.	.	.	82.80	82.60
N_PSB	92.60	94.40	.	.	.	.	.	93.40	90.80
O_PSB	108.00	115.00	108.00	99.70	.	.	.	105.00	110.00
N	7	7	6	5	2	1	1	7	7
AVG	97.428571	102.68571	99	100.7	101.9	108	82.8	92	96.128571
SEM	3.9534623	6.7360589	8.4391153	9.6813222	17.1	#DIV/0!	#DIV/0!	4.9919459	3.2432137

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	95.00	102.00	101.00	105.00	107.00	.	.	108.00	103.00
C_PSA	95.70	112.00	114.00	112.00	112.00	111.00	105.00	106.00	101.00
E_PSA	91.80	89.90	88.40	93.00	89.80	.	.	90.40	91.10
F_PSA	84.80	97.70	96.30	95.20	97.50	.	.	96.90	98.50
M_PSA	93.90	84.70	80.80	.	.	.	.	83.70	98.60
N_PSA	88.50	89.40	86.30	79.20	.	.	.	83.70	86.30
O_PSA	95.70	105.00	108.00	107.00	.	.	.	108.00	100.00
N	7	7	7	6	4	1	1	7	7
AVG	92.2	97.242857	96.4	98.566667	101.575	111	105	96.671429	96.928571
SEM	1.5723807	3.6953547	4.5639895	4.8660502	4.9444203	#DIV/0!	#DIV/0!	4.1392267	2.2629221

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	96.00	91.00	86.30	.	.	.	.	86.50	97.30
GWHPB	109.00	111.00	109.00	.	.	.	.	110.00	118.00
HWHPB	89.60	86.70	87.80	.	.	.	.	87.30	91.70
KWHPB	121.00	128.00	128.00	122.00	.	.	.	123.00	110.00
LWHPB	82.60	79.00	66.40	.	.	.	.	75.00	82.80
NWHPB	82.70	78.20	79.50	75.30	76.10	.	.	75.90	81.50
N	6	6	6	2	1	0	0	6	6
AVG	96.816667	95.65	92.833333	98.65	76.1	#DIV/0!	#DIV/0!	92.95	96.883333
SEM	6.2912859	8.0944322	9.0232539	23.35	#DIV/0!	#DIV/0!	#DIV/0!	7.9165123	5.9999676

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	70.00	68.50	65.70	62.40	.	.	.	64.50	73.20
GWHPA	104.00	97.60	95.80	90.50	.	.	.	92.50	113.00
HWHPA	88.80	84.30	87.20	88.60	.	.	.	88.00	94.50
KWHPA	110.00	115.00	112.00	105.00	.	.	.	109.00	111.00
LWHPA	87.80	87.30	81.00	.	.	.	.	83.20	90.10
NWHPA	75.70	59.30	53.50	57.00	66.70	.	.	65.50	83.00
N	6	6	6	5	1	0	0	6	6
AVG	89.383333	85.333333	82.533333	80.7	66.7	#DIV/0!	#DIV/0!	83.783333	94.133333
SEM	6.3363721	8.1580499	8.553193	9.0706119	#DIV/0!	#DIV/0!	#DIV/0!	6.918835	6.3744106

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	80.70	76.80	71.50	.	.	.	.	73.10	76.20
BWPSB	105.00	109.00	.	.	.	.	.	109.00	105.00
DWPSB	107.00	98.80	.	.	.	.	.	97.40	77.40
FWPSB	114.00	103.00	103.00	98.90	89.50	.	.	95.90	131.00
IWPSB	89.20	81.60	76.20	.	.	.	.	80.50	91.00
N	5	5	3	1	1	0	0	5	5
AVG	99.18	93.84	83.566667	98.9	89.5	#DIV/0!	#DIV/0!	91.18	96.12
SEM	6.147227	6.2390384	9.8109349	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	6.4010468	10.17086

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	70.10	70.60	67.00	.	.	.	.	69.00	68.50
BWPSA	76.50	92.20	86.60	.	.	.	.	89.90	97.20
DWPSA	94.20	92.70	.	.	.	.	.	91.70	94.80
FWPSA	93.00	85.80	87.00	77.10	.	.	.	79.60	108.00
IWPSA	76.20	73.40	72.20	.	.	.	.	72.90	77.70
N	5	5	4	1	0	0	0	5	5
AVG	82	82.94	78.2	77.1	#DIV/0!	#DIV/0!	#DIV/0!	80.62	89.24
SEM	4.875141	4.6501183	5.0780574	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	4.4974882	7.1046886

Table 4: Low Frequency Arterial Pressure Spectral Power ($mmHg^2$)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	3610.00	10300.00	9360.00	29800.00	22900.00	16700.00	.	23300.00	4880.00
D_HPB	6560.00	7270.00	5910.00	11100.00	.	.	.	11800.00	1710.00
G_HPB	3060.00	3300.00	5420.00	8740.00	6280.00	4330.00	4680.00	4380.00	2920.00
I_HPB	1530.00	5420.00	4680.00	.	.	.	.	5300.00	3080.00
J_HPB	873.00	1880.00	2680.00	698.00	.	.	.	2580.00	4150.00
K_HPB	2610.00	2120.00	2190.00	.	.	.	.	1560.00	779.00
L_HPB	3580.00	4930.00	3420.00	.	.	.	.	3270.00	2540.00
N	7	7	7	4	2	2	1	7	7
AVG	3117.5714	5031.4286	4808.5714	12584.5	14590	10515	4680	7455.7143	2865.5714
SEM	692.23702	1137.4165	921.11327	6155.2569	8310	6185	#DIV/0!	2927.9994	524.44401

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	3133.82	6072.59	.	.	.	7198.35	.	7198.35	1612.82
D_HPA	6560.00	7270.00	5910.00	11100.00	.	.	.	11800.00	1710.00
G_HPA	4630.00	4450.00	12700.00	12800.00	17400.00	11500.00	1830.00	12000.00	2020.00
I_HPA	1370.00	2050.00	8810.00	2900.00	.	.	.	3030.00	636.00
J_HPA	1230.00	1190.00	5210.00	2820.00	8400.00	10500.00	.	11300.00	378.00
K_HPA	3960.00	1720.00	7520.00	6040.00	.	.	.	6360.00	3670.00
L_HPA	2670.00	7440.00	9440.00	.	.	.	.	9650.00	2140.00
N	7	7	6	5	2	3	1	7	7
AVG	3364.8314	4313.227	8265	7132	12900	9732.7823	1830	8762.621	1738.1178
SEM	711.08559	1014.5941	1107.2631	2068.4158	4500	1299.6823	#DIV/0!	1272.5538	409.826

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	1780.00	3530.00	2920.00	7600.00	.	.	.	6060.00	798.00
C_PSB	4100.00	3360.00	4050.00	10000.00	4970.00	6090.00	3940.00	4780.00	768.00
E_PSB	2480.00	4600.00	6330.00	10400.00	10600.00	.	.	7720.00	1730.00
F_PSB	12200.00	8100.00	10800.00	5630.00	.	.	.	11800.00	6810.00
M_PSB	2450.00	7680.00	7240.00	.	.	.	.	7330.00	4250.00
N_PSB	1100.00	4520.00	.	.	.	.	.	5390.00	122.00
O_PSB	2810.00	7850.00	6330.00	4440.00	.	.	.	6310.00	1190.00
N	7	7	6	5	2	1	1	7	7
AVG	3845.7143	5662.8571	6278.3333	7614	7785	6090	3940	7055.7143	2238.2857
SEM	1435.5252	802.97279	1119.8137	1171.8686	2815	#DIV/0!	#DIV/0!	880.01314	913.12717

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	628.00	1120.00	1050.00	6390.00	12800.00	.	.	6400.00	773.00
C_PSA	3460.00	4920.00	5170.00	6650.00	9780.00	12300.00	11700.00	12300.00	3540.00
E_PSA	1580.00	5170.00	9000.00	5510.00	8880.00	.	.	10400.00	1350.00
F_PSA	10400.00	6730.00	4330.00	11900.00	7880.00	.	.	6190.00	7670.00
M_PSA	2070.00	6650.00	14800.00	.	.	.	.	9560.00	1230.00
N_PSA	1530.00	10200.00	10300.00	14800.00	.	.	.	13400.00	981.00
O_PSA	2470.00	5680.00	17200.00	14600.00	.	.	.	12800.00	1650.00
N	7	7	7	6	4	1	1	7	7
AVG	3162.5714	5781.4286	8835.7143	9975	9835	12300	11700	10150	2456.2857
SEM	1251.0574	1023.9174	2193.3958	1753.2917	1061.7713	#DIV/0!	#DIV/0!	1116.5657	935.34961

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	3920.00	13600.00	15000.00	.	.	.	.	17800.00	4050.00
GWHPB	5980.00	11600.00	9370.00	.	.	.	.	9760.00	5760.00
HWHPB	1470.00	4960.00	4670.00	.	.	.	.	6840.00	1110.00
KWHPB	3520.00	10200.00	17500.00	19800.00	.	.	.	18200.00	6110.00
LWHPB	990.00	3740.00	3650.00	.	.	.	.	3450.00	612.00
NWHPB	3950.00	4700.00	4610.00	6500.00	6980.00	.	.	7820.00	1130.00
N	6	6	6	2	1	0	0	6	6
AVG	3305	8133.3333	9133.3333	13150	6980	#DIV/0!	#DIV/0!	10645	3128.6667
SEM	746.60454	1706.19	2414.7031	6650	#DIV/0!	#DIV/0!	#DIV/0!	2471.7197	1017.5856

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	5790.00	7350.00	7510.00	4450.00	.	.	.	8840.00	4450.00
GWHPA	8610.00	22700.00	28100.00	5260.00	.	.	.	30600.00	2450.00
HWHPA	2530.00	4390.00	9830.00	5090.00	.	.	.	6660.00	4740.00
KWHPA	1640.00	5600.00	17300.00	12500.00	.	.	.	14300.00	3280.00
LWHPA	1700.00	3630.00	4560.00	.	.	.	.	6480.00	693.00
NWHPA	2830.00	4280.00	6640.00	7570.00	11500.00	.	.	11600.00	3030.00
N	6	6	6	5	1	0	0	6	6
AVG	3850	7991.6667	12323.333	6974	11500	#DIV/0!	#DIV/0!	13080	3107.1667
SEM	1135.9372	2990.2034	3631.4595	1479.0152	#DIV/0!	#DIV/0!	#DIV/0!	3712.0668	599.03369

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	1210.00	3570.00	4760.00	.	.	.	.	3250.00	588.00
BWPSB	1370.00	2360.00	.	.	.	.	.	2440.00	1500.00
DWPSB	6250.00	2770.00	.	.	.	.	.	2150.00	1570.00
FWPSB	4660.00	14600.00	25400.00	41300.00	29500.00	.	.	42800.00	2730.00
IWPSB	3230.00	1270.00	1360.00	.	.	.	.	1750.00	1320.00
N	5	5	3	1	1	0	0	5	5
AVG	3344	4914	10506.667	41300	29500	#DIV/0!	#DIV/0!	10478	1541.6
SEM	965.40976	2449.7277	7511.0703	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	8084.2399	344.47723

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	2040.00	1400.00	533.00	.	.	.	.	1150.00	2000.00
BWPSA	2300.00	5160.00	1890.00	.	.	.	.	8110.00	523.00
DWPSA	3870.00	5940.00	.	.	.	.	.	4950.00	2580.00
FWPSA	4090.00	21000.00	34900.00	21900.00	.	.	.	26300.00	8670.00
IWPSA	1850.00	1100.00	974.00	.	.	.	.	1740.00	2050.00
N	5	5	4	1	0	0	0	5	5
AVG	2830	6920	9574.25	21900	#DIV/0!	#DIV/0!	#DIV/0!	8450	3164.6
SEM	476.16174	3651.3504	8446.6454	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	4633.0454	1418.2359

Table 5: High Frequency Arterial Pressure Spectral Power (mmHg^2)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	549.00	613.00	1120.00	1630.00	702.00	1280.00	.	864.00	2740.00
D_HPB	613.00	528.00	1310.00	2290.00	.	.	.	1920.00	305.00
G_HPB	228.00	187.00	373.00	906.00	1100.00	739.00	240.00	307.00	1960.00
I_HPB	894.00	373.00	294.00	.	.	.	.	419.00	1710.00
J_HPB	228.00	365.00	454.00	414.00	.	.	.	686.00	2560.00
K_HPB	453.00	160.00	659.00	.	.	.	.	518.00	129.00
L_HPB	134.00	519.00	3220.00	.	.	.	.	1830.00	316.00
N	7	7	7	4	2	2	1	7	7
AVG	442.71429	392.14286	1061.4286	1310	901	1009.5	240	934.85714	1388.5714
SEM	101.36772	65.538948	387.86497	411.18041	199	270.5	#DIV/0!	252.26691	423.68867

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	375.38	424.30	.	.	.	1519.64	.	1519.64	742.23
D_HPA	613.00	528.00	1310.00	2290.00	.	.	.	1920.00	305.00
G_HPA	613.00	1410.00	1920.00	2670.00	3090.00	2150.00	1130.00	2730.00	426.00
I_HPA	724.00	438.00	453.00	580.00	.	.	.	572.00	985.00
J_HPA	260.00	149.00	277.00	574.00	923.00	989.00	.	1050.00	235.00
K_HPA	679.00	237.00	230.00	1300.00	.	.	.	907.00	689.00
L_HPA	171.00	1130.00	2420.00	.	.	.	.	2740.00	151.00
N	7	7	6	5	2	3	1	7	7
AVG	490.76876	616.61369	1101.6667	1482.8	2006.5	1552.8813	1130	1634.092	504.74652
SEM	82.883927	178.121	379.10954	432.16876	1083.5	335.5636	#DIV/0!	327.93562	115.98323

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	112.00	336.00	735.00	1050.00	.	.	.	790.00	380.00
C_PSB	642.00	350.00	303.00	469.00	959.00	1080.00	389.00	486.00	641.00
E_PSB	251.00	286.00	770.00	826.00	989.00	.	.	675.00	252.00
F_PSB	274.00	434.00	238.00	214.00	.	.	.	236.00	448.00
M_PSB	517.00	867.00	2910.00	.	.	.	.	2480.00	405.00
N_PSB	217.00	520.00	.	.	.	.	.	531.00	46.30
O_PSB	873.00	1760.00	1460.00	1080.00	.	.	.	1510.00	537.00
N	7	7	6	5	2	1	1	7	7
AVG	412.28571	650.42857	1069.3333	727.8	974	1080	389	958.28571	387.04286
SEM	103.44488	199.03551	409.08171	168.59253	15	#DIV/0!	#DIV/0!	295.0342	73.259402

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	150.00	328.00	792.00	4740.00	1480.00	.	.	737.00	58.90
C_PSA	1490.00	2160.00	3530.00	2550.00	1410.00	2400.00	1540.00	1280.00	1000.00
E_PSA	554.00	580.00	1500.00	2020.00	1740.00	.	.	2000.00	405.00
F_PSA	291.00	258.00	228.00	401.00	542.00	.	.	565.00	352.00
M_PSA	532.00	405.00	464.00	.	.	.	.	852.00	643.00
N_PSA	385.00	1150.00	2970.00	1550.00	.	.	.	2350.00	366.00
O_PSA	409.00	1440.00	1460.00	1470.00	.	.	.	1350.00	368.00
N	7	7	7	6	4	1	1	7	7
AVG	544.42857	903	1563.4286	2121.8333	1293	2400	1540	1304.8571	456.12857
SEM	166.03999	268.52374	474.28597	598.93352	260.20313	#DIV/0!	#DIV/0!	251.33609	111.03992

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	1100.00	2010.00	4610.00	.	.	.	.	3870.00	689.00
GWHPB	480.00	2990.00	3810.00	.	.	.	.	2970.00	693.00
HWHPB	433.00	882.00	1350.00	.	.	.	.	1370.00	522.00
KWHPB	186.00	1160.00	3000.00	5750.00	.	.	.	5370.00	234.00
LWHPB	957.00	2270.00	4210.00	.	.	.	.	2580.00	1300.00
NWHPB	1070.00	644.00	2620.00	2570.00	2620.00	.	.	2250.00	480.00
N	6	6	6	2	1	0	0	6	6
AVG	704.33333	1659.3333	3266.6667	4160	2620	#DIV/0!	#DIV/0!	3068.3333	653
SEM	157.7679	371.97837	488.28043	1590	#DIV/0!	#DIV/0!	#DIV/0!	569.86792	146.53282

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	150.00	316.00	1170.00	1140.00	.	.	.	940.00	98.10
GWHPA	799.00	1790.00	2490.00	2680.00	.	.	.	2390.00	532.00
HWHPA	633.00	511.00	912.00	414.00	.	.	.	903.00	860.00
KWHPA	380.00	761.00	1860.00	1810.00	.	.	.	1900.00	466.00
LWHPA	433.00	1620.00	3640.00	.	.	.	.	3200.00	256.00
NWHPA	1150.00	1040.00	1870.00	1410.00	2800.00	.	.	2620.00	1060.00
N	6	6	6	5	1	0	0	6	6
AVG	590.83333	1006.3333	1990.3333	1490.8	2800	#DIV/0!	#DIV/0!	1992.1667	545.35
SEM	143.92994	243.17054	401.59197	374.5112	#DIV/0!	#DIV/0!	#DIV/0!	379.17194	147.6595

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	511.00	529.00	889.00	.	.	.	.	560.00	566.00
BWPSB	639.00	408.00	.	.	.	.	.	438.00	722.00
DWPSB	2500.00	791.00	.	.	.	.	.	659.00	1390.00
FWPSB	839.00	2480.00	2430.00	3170.00	1590.00	.	.	3070.00	366.00
IWPSB	3380.00	767.00	105.00	.	.	.	.	595.00	1760.00
N	5	5	3	1	1	0	0	5	5
AVG	1573.8	995	1141.3333	3170	1590	#DIV/0!	#DIV/0!	1064.4	960.8
SEM	577.21447	378.18977	682.92516	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	502.68843	263.59181

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	584.00	607.00	290.00	.	.	.	.	759.00	567.00
BWPSA	496.00	1540.00	733.00	.	.	.	.	1370.00	888.00
DWPSA	926.00	1030.00	.	.	.	.	.	740.00	2310.00
FWPSA	343.00	510.00	1130.00	881.00	.	.	.	870.00	1430.00
IWPSA	2050.00	650.00	660.00	.	.	.	.	568.00	1610.00
N	5	5	4	1	0	0	0	5	5
AVG	879.8	867.4	703.25	881	#DIV/0!	#DIV/0!	#DIV/0!	861.4	1361
SEM	307.77076	189.95199	172.15467	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	136.02485	301.78867

Table 6: Heart Rate Means (beats per minute)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	68.10	78.30	99.20	116.00	137.00	148.00	.	142.00	54.50
D_HPB	62.30	74.30	82.50	95.50	.	.	.	92.60	56.40
G_HPB	57.90	63.70	72.80	82.90	92.10	108.00	122.00	120.00	53.30
I_HPB	67.00	72.80	99.00	.	.	.	.	90.90	57.60
J_HPB	56.80	62.80	72.30	80.60	.	.	.	75.30	53.70
K_HPB	61.00	78.60	90.70	.	.	.	.	87.00	62.50
L_HPB	50.70	62.90	85.80	.	.	.	.	76.90	45.30
N	7	7	7	4	2	2	1	7	7
AVG	60.542857	70.485714	86.042857	93.75	114.55	128	122	97.814286	54.757143
SEM	2.2885696	2.7144611	4.196192	8.1074554	22.45	20	#DIV/0!	9.2335163	1.9728946

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	64.00	75.00	85.50	94.20	105.00	114.00	.	109.00	63.30
D_HPA	69.70	81.80	91.10	100.00	116.00	.	.	113.00	59.30
G_HPA	64.70	77.20	89.00	104.00	121.00	140.00	144.00	141.00	63.00
I_HPA	64.80	77.10	91.80	105.00	.	.	.	103.00	57.90
J_HPA	58.00	61.30	71.50	79.70	92.10	109.00	.	102.00	59.60
K_HPA	63.50	76.10	87.20	101.00	.	.	.	98.10	57.80
L_HPA	50.10	68.50	88.00	.	.	.	.	82.20	47.90
N	7	7	7	6	4	3	1	7	7
AVG	62.114286	73.857143	86.3	97.316667	108.525	121	144	106.9	58.4
SEM	2.381419	2.5704231	2.6001831	3.849365	6.4142257	9.6090235	#DIV/0!	6.7808905	1.9412809

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	52.80	69.30	74.60	86.20	102.00	.	.	98.30	42.10
C_PSB	54.40	63.10	64.70	71.10	75.60	86.80	104.00	97.50	52.00
E_PSB	66.90	79.40	89.40	105.00	136.00	.	.	126.00	69.80
F_PSB	69.50	81.60	94.30	111.00	.	.	.	107.00	67.00
M_PSB	57.00	66.80	76.80	.	.	.	.	73.00	49.50
N_PSB	61.30	71.70	.	.	.	.	.	71.60	56.20
O_PSB	85.30	115.00	140.00	147.00	.	.	.	142.00	98.40
N	7	7	6	5	3	1	1	7	7
AVG	63.885714	78.128571	89.966667	104.06	104.53333	86.8	104	102.2	62.142857
SEM	4.2710224	6.6307981	10.909221	12.841791	17.481927	#DIV/0!	#DIV/0!	9.7587811	7.0652691

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	54.30	61.10	69.20	84.20	106.00	.	.	99.70	51.30
C_PSA	67.80	76.30	83.60	91.90	100.00	110.00	129.00	124.00	64.90
E_PSA	64.30	69.60	77.00	94.50	111.00	.	.	106.00	58.40
F_PSA	56.30	66.50	80.50	91.70	111.00	.	.	107.00	58.30
M_PSA	51.00	60.80	68.20	.	.	.	.	66.20	50.20
N_PSA	74.50	87.90	101.00	111.00	.	.	.	104.00	72.90
O_PSA	78.00	90.10	125.00	128.00	.	.	.	126.00	76.00
N	7	7	7	6	4	1	1	7	7
AVG	63.742857	73.185714	86.357143	100.21667	107	110	129	104.7	61.714286
SEM	3.9118171	4.5495384	7.6550592	6.6310088	2.6140645	#DIV/0!	#DIV/0!	7.4656356	3.7891718

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	73.00	93.60	124.00	.	.	.	.	117.00	70.30
GWHPB	65.70	87.90	117.00	.	.	.	.	104.00	59.60
HWHPB	62.20	80.80	106.00	.	.	.	.	91.30	60.10
KWHPB	74.30	89.10	105.00	123.00	.	.	.	117.00	68.30
LWHPB	60.70	85.90	126.00	.	.	.	.	97.00	54.40
NWHPB	57.70	65.60	84.90	103.00	125.00	.	.	121.00	56.30
N	6	6	6	2	1	0	0	6	6
AVG	65.6	83.816667	110.48333	113	125	#DIV/0!	#DIV/0!	107.88333	61.5
SEM	2.7594685	4.0232173	6.2466213	10	#DIV/0!	#DIV/0!	#DIV/0!	4.9893498	2.6248809

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	58.00	66.80	84.30	103.00	.	.	.	93.70	50.80
GWHPA	67.20	79.10	112.00	131.00	.	.	.	117.00	58.00
HWHPA	60.20	75.60	98.10	124.00	.	.	.	109.00	57.30
KWHPA	73.00	86.80	101.00	112.00	.	.	.	106.00	71.60
LWHPA	62.80	82.70	114.00	.	.	.	.	104.00	57.00
NWHPA	58.80	70.90	87.50	108.00	129.00	.	.	125.00	56.20
N	6	6	6	5	1	0	0	6	6
AVG	63.333333	76.983333	99.483333	115.6	129	#DIV/0!	#DIV/0!	109.11667	58.483333
SEM	2.3628608	3.0339651	4.9858076	5.1826634	#DIV/0!	#DIV/0!	#DIV/0!	4.4272201	2.8291832

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	59.20	73.20	89.70	.	.	.	.	84.90	63.80
BWPSB	56.20	79.00	.	.	.	.	.	79.30	49.80
DWPSB	51.90	65.80	.	.	.	.	.	66.40	47.50
FWPSB	63.20	68.30	77.50	90.30	106.00	.	.	95.50	53.60
IWPSB	54.40	79.60	96.80	.	.	.	.	85.30	55.20
N	5	5	3	1	1	0	0	5	5
AVG	56.98	73.18	88	90.3	106	#DIV/0!	#DIV/0!	82.28	53.98
SEM	1.9581624	2.7691876	5.6358969	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	4.7529359	2.8064925

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	62.50	81.30	99.20	.	.	.	.	88.90	64.70
BWPSA	58.30	95.50	154.00	.	.	.	.	116.00	48.20
DWPSA	52.70	71.60	.	.	.	.	.	71.70	47.30
FWPSA	62.90	75.80	87.20	105.00	.	.	.	101.00	55.50
IWPSA	58.50	90.20	115.00	.	.	.	.	99.30	56.40
N	5	5	4	1	0	0	0	5	5
AVG	58.98	82.88	113.85	105	#DIV/0!	#DIV/0!	#DIV/0!	95.38	54.42
SEM	1.8423898	4.4311849	14.543584	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	7.330989	3.1634475

Table 7: Low Frequency Heart Rate Spectral Power (bpm^2)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	4800.00	18800.00	13500.00	.	8100.00	1060.00	.	14900.00	7800.00
D_HPB	2470.00	2770.00	5120.00	7120.00	.	.	.	6870.00	579.00
G_HPB	1710.00	3620.00	10800.00	9840.00	7240.00	5550.00	1440.00	1850.00	1310.00
I_HPB	2540.00	10800.00	2840.00	.	.	.	.	5190.00	2130.00
J_HPB	227.00	494.00	659.00	335.00	.	.	.	936.00	394.00
K_HPB	2020.00	1270.00	2370.00	.	.	.	.	1460.00	485.00
L_HPB	1740.00	3190.00	1800.00	.	.	.	.	2960.00	2260.00
N	7	7	7	3	2	2	1	7	7
AVG	2215.2857	5849.1429	5298.4286	5765	7670	3305	1440	4880.8571	2136.8571
SEM	519.24151	2504.2965	1864.1209	2826.2623	430	2245	#DIV/0!	1855.3361	987.57993

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	6520.00	8190.00	9450.00	23800.00	32800.00	24600.00	.	32400.00	5400.00
D_HPA	2730.00	2090.00	2860.00	2240.00	2300.00	.	.	2800.00	1510.00
G_HPA	1990.00	7400.00	6270.00	12700.00	7750.00	1790.00	234.00	1520.00	1120.00
I_HPA	3230.00	3850.00	11300.00	2260.00	.	.	.	2890.00	1340.00
J_HPA	195.00	191.00	673.00	744.00	695.00	422.00	.	866.00	368.00
K_HPA	3490.00	1160.00	3340.00	4210.00	.	.	.	4100.00	2030.00
L_HPA	1850.00	6940.00	16500.00	.	.	.	.	13100.00	1180.00
N	7	7	7	6	4	3	1	7	7
AVG	2857.8571	4260.1429	7199	7659	10886.25	8937.3333	234	8239.4286	1849.7143
SEM	737.20019	1229.8922	2101.951	3670.4729	7458.9642	7841.2839	#DIV/0!	4315.5731	620.84281

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	1470.00	6630.00	9350.00	17700.00	4690.00	.	.	4950.00	1350.00
C_PSB	6080.00	2110.00	1930.00	3520.00	5170.00	4550.00	2230.00	4210.00	1600.00
E_PSB	3680.00	6360.00	16100.00	20100.00	4750.00	.	.	7030.00	5160.00
F_PSB	1890.00	1690.00	2020.00	406.00	.	.	.	1770.00	2840.00
M_PSB	3550.00	10800.00	8440.00	.	.	.	.	11800.00	7850.00
N_PSB	853.00	3290.00	.	.	.	.	.	3530.00	67.30
O_PSB	3110.00	12100.00	3930.00	498.00	.	.	.	3370.00	3160.00
N	7	7	6	5	3	1	1	7	7
AVG	2947.5714	6140	6961.6667	8444.8	4870	4550	2230	5237.1429	3146.7571
SEM	662.3689	1556.0297	2238.5076	4321.6317	150.99669	#DIV/0!	#DIV/0!	1252.0891	992.49284

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	138.00	1550.00	1590.00	2730.00	5300.00	.	.	4080.00	111.00
C_PSA	8640.00	7080.00	7360.00	3710.00	13200.00	20500.00	1280.00	8110.00	15500.00
E_PSA	2890.00	3720.00	6880.00	5800.00	8540.00	.	.	19900.00	1970.00
F_PSA	1690.00	2490.00	1100.00	1900.00	393.00	.	.	453.00	4470.00
M_PSA	1860.00	6820.00	24100.00	.	.	.	.	15000.00	3470.00
N_PSA	2130.00	8280.00	11200.00	7400.00	.	.	.	8910.00	1180.00
O_PSA	2320.00	5830.00	2370.00	4930.00	.	.	.	4150.00	1770.00
N	7	7	7	6	4	1	1	7	7
AVG	2809.7143	5110	7800	4411.6667	6858.25	20500	1280	8657.5714	4067.2857
SEM	1023.4661	961.67513	3052.0446	831.76686	2696.8141	#DIV/0!	#DIV/0!	2561.4798	1981.4054

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	1560.00	5560.00	1890.00	.	.	.	.	4530.00	2830.00
GWHPB	2080.00	7430.00	2550.00	.	.	.	.	5200.00	2770.00
HWHPB	1080.00	15900.00	6290.00	.	.	.	.	21800.00	708.00
KWHPB	2430.00	9760.00	16200.00	9410.00	.	.	.	11800.00	3080.00
LWHPB	1950.00	11200.00	2110.00	.	.	.	.	9520.00	1450.00
NWHPB	6650.00	3260.00	5150.00	4500.00	1120.00	.	.	1760.00	1670.00
N	6	6	6	2	1	0	0	6	6
AVG	2625	8851.6667	5698.3333	6955	1120	#DIV/0!	#DIV/0!	9101.6667	2084.6667
SEM	826.89278	1827.0348	2222.8157	2455	#DIV/0!	#DIV/0!	#DIV/0!	2936.7038	386.68908

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	1320.00	3290.00	3230.00	3340.00	.	.	.	4640.00	1940.00
GWHPA	5090.00	8360.00	11100.00	1430.00	.	.	.	11900.00	1140.00
HWHPA	1050.00	15500.00	22200.00	1820.00	.	.	.	12500.00	1800.00
KWHPA	3720.00	4510.00	13400.00	2480.00	.	.	.	13500.00	3660.00
LWHPA	2350.00	12600.00	8450.00	.	.	.	.	14700.00	1250.00
NWHPA	3630.00	5670.00	6360.00	1830.00	782.00	.	.	1390.00	2420.00
N	6	6	6	5	1	0	0	6	6
AVG	2860	8321.6667	10790	2180	782	#DIV/0!	#DIV/0!	9771.6667	2035
SEM	638.04911	1972.4087	2704.0118	335.4251	#DIV/0!	#DIV/0!	#DIV/0!	2211.7028	377.28636

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	844.00	3770.00	3420.00	.	.	.	.	1700.00	1080.00
BWPSB	5010.00	6610.00	.	.	.	.	.	7320.00	1930.00
DWPSB	8790.00	2330.00	.	.	.	.	.	1730.00	1140.00
FWPSB	1070.00	1650.00	3940.00	6130.00	4620.00	.	.	5640.00	764.00
IWPSB	7180.00	5900.00	3350.00	.	.	.	.	7720.00	3580.00
N	5	5	3	1	1	0	0	5	5
AVG	4578.8	4052	3570	6130	4620	#DIV/0!	#DIV/0!	4822	1698.8
SEM	1596.0387	968.83642	186.10033	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1315.5774	508.00535

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	1370.00	1990.00	2490.00	.	.	.	.	2240.00	3270.00
BWPSA	3520.00	16300.00	413.00	.	.	.	.	15400.00	1020.00
DWPSA	4650.00	3440.00	.	.	.	.	.	2510.00	2170.00
FWPSA	860.00	7790.00	21600.00	8290.00	.	.	.	11500.00	1730.00
IWPSA	5390.00	3220.00	2650.00	.	.	.	.	4060.00	6550.00
N	5	5	4	1	0	0	0	5	5
AVG	3158	6548	6788.25	8290	#DIV/0!	#DIV/0!	#DIV/0!	7142	2948
SEM	889.28848	2628.2568	4963.465	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	2666.1815	971.7016

Table 8: High Frequency Heart Rate Spectral Power (bpm^2)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	2320.00	3420.00	1910.00	8720.00	733.00	284.00	.	1940.00	10500.00
D_HPB	700.00	375.00	254.00	462.00	.	.	.	402.00	536.00
G_HPB	838.00	1270.00	2210.00	2940.00	3190.00	1340.00	208.00	273.00	1100.00
I_HPB	2810.00	2210.00	294.00	.	.	.	.	822.00	7340.00
J_HPB	101.00	41.10	27.80	17.70	.	.	.	38.00	68.10
K_HPB	1030.00	553.00	264.00	.	.	.	.	361.00	190.00
L_HPB	374.00	221.00	393.00	.	.	.	.	236.00	803.00
N	7	7	7	4	2	2	1	7	7
AVG	1167.5714	1155.7286	764.68571	3034.925	1961.5	812	208	581.71429	2933.8714
SEM	382.32247	471.58306	338.58459	2001.0972	1228.5	528	#DIV/0!	243.68879	1589.0641

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	2630.00	5020.00	3050.00	5430.00	5160.00	7010.00	.	5620.00	4100.00
D_HPA	270.00	274.00	286.00	333.00	390.00	.	.	498.00	550.00
G_HPA	395.00	1950.00	1910.00	2750.00	1510.00	216.00	11.80	169.00	204.00
I_HPA	3400.00	1650.00	931.00	246.00	.	.	.	339.00	6030.00
J_HPA	113.00	47.10	32.40	20.20	24.00	13.30	.	17.60	76.80
K_HPA	1390.00	596.00	275.00	410.00	.	.	.	377.00	3350.00
L_HPA	250.00	427.00	996.00	.	.	.	.	956.00	303.00
N	7	7	7	6	4	3	1	7	7
AVG	1206.8571	1423.4429	1068.6286	1531.5333	1771	2413.1	11.8	1139.5143	2087.6857
SEM	500.42042	657.5009	407.49171	881.54688	1173.052	2299.1947	#DIV/0!	755.02777	904.04121

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	623.00	771.00	1770.00	2210.00	1240.00	.	.	433.00	1430.00
C_PSB	1320.00	593.00	277.00	963.00	2070.00	1960.00	219.00	1060.00	755.00
E_PSB	1160.00	1130.00	1340.00	1030.00	426.00	.	.	1190.00	1060.00
F_PSB	897.00	452.00	285.00	111.00	.	.	.	146.00	923.00
M_PSB	1950.00	1640.00	2140.00	.	.	.	.	2340.00	1230.00
N_PSB	328.00	806.00	.	.	.	.	.	907.00	136.00
O_PSB	1630.00	3900.00	858.00	40.20	.	.	.	666.00	1100.00
N	7	7	6	5	3	1	1	7	7
AVG	1129.7143	1327.4286	1111.6667	870.84	1245.3333	1960	219	963.14286	947.71429
SEM	213.47139	453.61153	315.56306	393.35064	474.58941	#DIV/0!	#DIV/0!	267.1187	157.71534

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	31.50	411.00	383.00	491.00	565.00	.	.	282.00	22.70
C_PSA	3190.00	1870.00	2100.00	1470.00	2680.00	7400.00	294.00	1640.00	3430.00
E_PSA	1750.00	1500.00	815.00	1150.00	2080.00	.	.	2770.00	1070.00
F_PSA	1080.00	1140.00	376.00	300.00	68.20	.	.	99.60	1500.00
M_PSA	1780.00	1210.00	1630.00	.	.	.	.	2110.00	1770.00
N_PSA	343.00	3220.00	3480.00	1400.00	.	.	.	2540.00	500.00
O_PSA	757.00	2780.00	363.00	567.00	.	.	.	463.00	508.00
N	7	7	7	6	4	1	1	7	7
AVG	1275.9286	1733	1306.7143	896.33333	1348.3	7400	294	1414.9429	1257.2429
SEM	404.41416	370.11253	444.7804	206.19484	616.51066	#DIV/0!	#DIV/0!	424.13975	429.19254

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	491.00	567.00	316.00	.	.	.	.	593.00	1220.00
GWHPB	749.00	1540.00	928.00	.	.	.	.	1540.00	2110.00
HWHPB	588.00	5740.00	4280.00	.	.	.	.	7850.00	716.00
KWHPB	418.00	2620.00	3190.00	3780.00	.	.	.	4150.00	241.00
LWHPB	4540.00	4410.00	324.00	.	.	.	.	4260.00	3630.00
NWHPB	1610.00	1690.00	2070.00	814.00	66.40	.	.	169.00	993.00
N	6	6	6	2	1	0	0	6	6
AVG	1399.3333	2761.1667	1851.3333	2297	66.4	#DIV/0!	#DIV/0!	3093.6667	1485
SEM	652.62157	797.18339	665.35217	1483	#DIV/0!	#DIV/0!	#DIV/0!	1187.7117	498.09089

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	1490.00	770.00	1470.00	670.00	.	.	.	934.00	745.00
GWHPA	1740.00	2240.00	2020.00	227.00	.	.	.	1940.00	1490.00
HWHPA	1080.00	5480.00	1940.00	278.00	.	.	.	1700.00	2670.00
KWHPA	1660.00	1440.00	1610.00	189.00	.	.	.	1170.00	1430.00
LWHPA	3140.00	6960.00	4240.00	.	.	.	.	5810.00	1290.00
NWHPA	1770.00	3490.00	2120.00	478.00	65.20	.	.	108.00	1960.00
N	6	6	6	5	1	0	0	6	6
AVG	1813.3333	3396.6667	2233.3333	368.4	65.2	#DIV/0!	#DIV/0!	1943.6667	1597.5
SEM	284.78842	985.09108	414.01825	90.367361	#DIV/0!	#DIV/0!	#DIV/0!	816.40634	267.24443

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	753.00	1110.00	746.00	.	.	.	.	805.00	1130.00
BWPSB	6820.00	4820.00	.	.	.	.	.	5080.00	2590.00
DWPSB	8150.00	906.00	.	.	.	.	.	676.00	4420.00
FWPSB	184.00	235.00	337.00	211.00	214.00	.	.	177.00	670.00
IWPSB	13900.00	7390.00	706.00	.	.	.	.	5630.00	9110.00
N	5	5	3	1	1	0	0	5	5
AVG	5961.4	2892.2	596.33333	211	214	#DIV/0!	#DIV/0!	2473.6	3584
SEM	2540.2196	1380.7345	130.17979	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1184.1906	1528.6779

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	1460.00	1000.00	370.00	.	.	.	.	1150.00	1870.00
BWPSA	3790.00	4120.00	43.20	.	.	.	.	1480.00	3840.00
DWPSA	3560.00	522.00	.	.	.	.	.	465.00	3800.00
FWPSA	131.00	229.00	542.00	356.00	.	.	.	339.00	301.00
IWPSA	18400.00	2350.00	307.00	.	.	.	.	2990.00	11400.00
N	5	5	4	1	0	0	0	5	5
AVG	5468.2	1644.2	315.55	356	#DIV/0!	#DIV/0!	#DIV/0!	1284.8	4242.2
SEM	3303.3347	717.80418	103.47787	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	475.95119	1907.2467

Table 9: Total Peripheral Resistance Means (mmHg/L/min)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	12.90	18.00	14.90	15.50	16.40	15.10	.	15.80	13.70
D_HPB	12.40	15.20	15.10	14.30	.	.	.	14.50	14.90
G_HPB	16.20	19.90	20.20	20.60	20.20	17.70	17.20	17.30	15.20
I_HPB	7.08	20.20	7.51	.	.	.	.	8.56	5.47
J_HPB	22.70	26.00	25.90	29.40	.	.	.	26.80	26.70
K_HPB	12.10	22.20	22.20	.	.	.	.	22.40	13.00
L_HPB	10.70	15.70	13.50	.	.	.	.	14.80	10.30
N	7	7	7	4	2	2	1	7	7
AVG	13.44	19.6	17.044286	19.95	18.3	16.4	17.2	17.165714	14.181429
SEM	1.8547956	1.4251149	2.3238226	3.4332929	1.9	1.3	#DIV/0!	2.2299977	2.4438966

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	7.30	8.05	.	.	.	9.01	.	9.01	7.69
D_HPA	10.90	15.60	15.20	15.00	15.30	.	.	15.40	14.50
G_HPA	11.10	15.00	15.30	14.50	14.30	13.00	13.00	12.90	13.30
I_HPA	7.13	9.54	8.88	7.41	.	.	.	7.69	5.99
J_HPA	15.00	17.70	18.70	19.10	17.00	13.60	.	15.00	15.30
K_HPA	11.80	16.40	16.50	14.30	.	.	.	14.90	12.30
L_HPA	11.60	13.90	12.00	.	.	.	.	12.70	8.62
N	7	7	6	5	3	3	1	7	7
AVG	10.689318	13.74184	14.43	14.062	15.533333	11.870938	13	12.514688	11.100586
SEM	1.0356338	1.3611384	1.4209738	1.8809423	0.788106	1.4395198	#DIV/0!	1.1538244	1.3744492

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	16.20	21.10	23.70	27.10	.	.	.	26.30	17.70
C_PSB	19.60	27.30	27.90	27.20	24.70	21.40	16.70	18.10	19.80
E_PSB	11.60	11.40	11.40	11.10	10.00	.	.	10.10	11.50
F_PSB	20.30	19.80	16.40	13.80	.	.	.	14.40	19.60
M_PSB	14.90	17.10	17.10	.	.	.	.	17.00	14.60
N_PSB	10.40	15.30	.	.	.	.	.	15.20	9.41
O_PSB	7.31	7.97	8.40	9.53	.	.	.	9.74	9.99
N	7	7	6	5	2	1	1	7	7
AVG	14.33	17.138571	17.483333	17.746	17.35	21.4	16.7	15.834286	14.657143
SEM	1.8219155	2.4221522	2.9888032	3.8994764	7.35	#DIV/0!	#DIV/0!	2.1185427	1.6862564

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	15.10	20.10	21.40	22.40	19.70	.	20.90	15.00	0.00
C_PSA	14.70	19.10	19.50	18.70	18.70	19.90	17.30	18.20	18.40
E_PSA	10.20	10.40	10.90	10.90	9.94	.	.	10.20	8.93
F_PSA	16.00	21.40	20.20	18.80	18.70	.	.	18.50	17.30
M_PSA	16.20	14.70	15.30	.	.	.	.	15.10	16.60
N_PSA	8.32	9.40	8.89	8.49	.	.	.	9.07	7.02
O_PSA	6.27	9.42	9.10	10.20	.	.	.	10.30	7.52
N	7	7	7	6	4	1	2	7	7
AVG	12.398571	14.931429	15.041429	14.915	16.76	19.9	19.1	13.767143	10.824286
SEM	1.5356345	1.9969828	2.0544961	2.3457533	2.2855196	#DIV/0!	1.8	1.4812747	2.5765868

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	14.50	13.60	11.60	.	.	.	.	11.80	13.70
GWHPB	10.70	17.00	16.00	.	.	.	.	16.40	10.60
HWHPB	12.20	11.60	10.00	.	.	.	.	11.10	10.30
KWHPB	17.20	20.10	17.80	17.30	.	.	.	17.50	16.20
LWHPB	9.92	10.80	9.35	.	.	.	.	10.30	11.10
NWHPB	12.50	12.40	14.70	12.80	12.10	.	.	12.20	13.90
N	6	6	6	2	1	0	0	6	6
AVG	12.836667	14.25	13.241667	15.05	12.1	#DIV/0!	#DIV/0!	13.216667	12.633333
SEM	1.0862218	1.4669129	1.4007389	2.25	#DIV/0!	#DIV/0!	#DIV/0!	1.2180358	0.9555685

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	13.80	13.40	14.80	14.50	.	.	.	14.70	11.70
GWHPA	11.50	16.10	15.60	16.40	.	.	.	15.60	13.00
HWHPA	9.85	9.77	10.70	10.50	.	.	.	10.60	9.00
KWHPA	14.10	18.10	16.20	14.40	.	.	.	15.30	14.60
LWHPA	12.90	15.90	13.60	.	.	.	.	14.50	13.70
NWHPA	10.30	12.00	9.42	8.45	9.75	.	.	9.57	13.10
N	6	6	6	5	1	0	0	6	6
AVG	12.075	14.211667	13.386667	12.85	9.75	#DIV/0!	#DIV/0!	13.378333	12.516667
SEM	0.7345917	1.2491875	1.1226358	1.4596232	#DIV/0!	#DIV/0!	#DIV/0!	1.0623258	0.8030843

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	12.60	14.80	13.90	.	.	.	.	14.10	11.50
BWPSB	21.90	23.20	.	.	.	.	.	23.20	20.80
DWPSB	27.00	26.80	.	.	.	.	.	27.00	21.10
FWPSB	21.40	23.00	25.30	24.20	19.80	.	.	22.90	27.90
IWPSB	15.80	15.90	12.50	.	.	.	.	15.30	13.90
N	5	5	3	1	1	0	0	5	5
AVG	19.74	20.74	17.233333	24.2	19.8	#DIV/0!	#DIV/0!	20.5	19.04
SEM	2.5162671	2.3085926	4.0535307	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	2.4829418	2.9078514

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	9.47	12.30	11.20	.	.	.	.	11.60	9.37
BWPSA	13.20	19.30	17.70	.	.	.	.	18.30	19.60
DWPSA	20.30	30.50	.	.	.	.	.	30.40	21.60
FWPSA	19.50	19.40	19.40	16.00	.	.	.	16.80	20.40
IWPSA	11.70	12.40	11.80	.	.	.	.	12.10	11.60
N	5	5	4	1	0	0	0	5	5
AVG	14.834	18.78	15.025	16	#DIV/0!	#DIV/0!	#DIV/0!	17.84	16.514
SEM	2.1553784	3.3219573	2.0681614	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	3.3980288	2.5067501

Table 10: Low Frequency Total Peripheral Resistance Spectral Power $(mmHg/L/min)^2$

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	436.00	2520.00	726.00	3510.00	1850.00	494.00	.	2900.00	1250.00
D_HPB	354.00	478.00	520.00	799.00	.	.	.	1100.00	555.00
G_HPB	273.00	813.00	2120.00	1120.00	1050.00	557.00	333.00	346.00	240.00
I_HPB	120.00	2120.00	161.00	.	.	.	.	270.00	57.90
J_HPB	566.00	1450.00	967.00	393.00	.	.	.	1790.00	1230.00
K_HPB	311.00	551.00	312.00	.	.	.	.	271.00	264.00
L_HPB	182.00	357.00	371.00	.	.	.	.	.	118.00
N	7	7	7	4	2	2	1	6	7
AVG	320.28571	1184.1429	739.57143	1455.5	1450	525.5	333	1112.8333	530.7
SEM	57.000716	325.5926	251.61903	700.79889	400	31.5	#DIV/0!	434.34889	192.5085

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	275.04	239.44	.	.	.	370.79	.	370.79	504.68
D_HPA	235.00	577.00	505.00	301.00	1030.00	.	.	1290.00	206.00
G_HPA	215.00	326.00	584.00	701.00	767.00	430.00	36.00	339.00	260.00
I_HPA	106.00	153.00	364.00	92.50	.	.	.	90.70	57.40
J_HPA	270.00	795.00	1570.00	578.00	745.00	494.00	.	532.00	1770.00
K_HPA	256.00	500.00	381.00	561.00	.	.	.	558.00	282.00
L_HPA	.	.	.	.	.	.	.	.	.
N	6	6	5	5	3	3	1	6	6
AVG	226.17293	431.74001	680.8	446.7	847.33333	431.59779	36	530.08223	513.34709
SEM	25.718025	97.223784	225.96402	109.92243	91.55387	35.575662	#DIV/0!	166.65335	258.15421

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	263.00	1330.00	1200.00	2470.00	.	.	.	1910.00	580.00
C_PSB	785.00	1360.00	1150.00	2470.00	1200.00	867.00	1100.00	1030.00	435.00
E_PSB	238.00	509.00	311.00	940.00	435.00	.	.	435.00	513.00
F_PSB	1310.00	773.00	718.00	490.00	.	.	.	734.00	521.00
M_PSB	355.00	566.00	251.00	.	.	.	.	467.00	826.00
N_PSB	58.90	376.00	.	.	.	.	.	410.00	21.70
O_PSB	149.00	376.00	309.00	1000.00	.	.	.	307.00	80.60
N	7	7	6	5	2	1	1	7	7
AVG	451.27143	755.71429	656.5	1474	817.5	867	1100	756.14286	425.32857
SEM	167.92231	160.39308	177.69576	416.06009	382.5	#DIV/0!	#DIV/0!	213.53905	107.25443

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	312.00	875.00	583.00	1060.00	1260.00	.	913.00	112.00	0.00
C_PSA	1300.00	863.00	749.00	680.00	1450.00	1800.00	2240.00	3670.00	1930.00
E_PSA	124.00	262.00	372.00	347.00	357.00	.	.	496.00	83.50
F_PSA	558.00	543.00	284.00	515.00	372.00	.	.	263.00	910.00
M_PSA	681.00	268.00	1290.00	.	.	.	.	979.00	980.00
N_PSA	89.10	258.00	348.00	492.00	.	.	.	357.00	42.70
O_PSA	93.60	191.00	333.00	464.00	.	.	.	483.00	68.70
N	7	7	7	6	4	1	2	7	7
AVG	451.1	465.71429	565.57143	593	859.75	1800	1576.5	908.57143	573.55714
SEM	166.91217	112.39042	136.0082	103.13422	288.56726	#DIV/0!	663.5	471.50452	277.06543

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	754.00	504.00	470.00	.	.	.	.	622.00	1370.00
GWHPB	130.00	595.00	785.00	.	.	.	.	775.00	270.00
HWHPB	203.00	208.00	159.00	.	.	.	.	401.00	204.00
KWHPB	666.00	2260.00	1620.00	1250.00	.	.	.	1330.00	753.00
LWHPB	76.70	261.00	137.00	.	.	.	.	194.00	79.90
NWHPB	315.00	87.20	236.00	419.00	248.00	.	.	317.00	207.00
N	6	6	6	2	1	0	0	6	6
AVG	357.45	652.53333	567.83333	834.5	248	#DIV/0!	#DIV/0!	606.5	480.65
SEM	116.71416	330.64741	232.85638	415.5	#DIV/0!	#DIV/0!	#DIV/0!	168.15484	201.78466

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	280.00	965.00	911.00	1050.00	.	.	.	781.00	620.00
GWHPA	280.00	1170.00	1620.00	966.00	.	.	.	1820.00	89.40
HWHPA	121.00	378.00	417.00	374.00	.	.	.	384.00	374.00
KWHPA	286.00	670.00	607.00	1090.00	.	.	.	774.00	653.00
LWHPA	485.00	544.00	643.00	.	.	.	.	1280.00	380.00
NWHPA	156.00	3640.00	225.00	247.00	303.00	.	.	348.00	1370.00
N	6	6	6	5	1	0	0	6	6
AVG	268	1227.8333	737.16667	745.4	303	#DIV/0!	#DIV/0!	897.83333	581.06667
SEM	52.234727	496.38684	200.0204	179.79644	#DIV/0!	#DIV/0!	#DIV/0!	230.34531	178.33924

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	303.00	495.00	295.00	.	.	.	.	218.00	127.00
BWPSB	1220.00	1000.00	.	.	.	.	.	1130.00	1230.00
DWPSB	3540.00	2370.00	.	.	.	.	.	2560.00	514.00
FWPSB	1220.00	2420.00	3580.00	5020.00	1660.00	.	.	4520.00	1910.00
IWPSB	1280.00	1420.00	157.00	.	.	.	.	1830.00	824.00
N	5	5	3	1	1	0	0	5	5
AVG	1512.6	1541	1344	5020	1660	#DIV/0!	#DIV/0!	2051.6	921
SEM	538.46147	378.24066	1118.7095	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	728.42334	306.52047

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	79.50	171.00	107.00	.	.	.	.	156.00	475.00
BWPSA	191.00	1560.00	698.00	.	.	.	.	1650.00	622.00
DWPSA	1470.00	8300.00	.	.	.	.	.	9370.00	1060.00
FWPSA	1090.00	2130.00	4030.00	3300.00	.	.	.	4140.00	2270.00
IWPSA	418.00	322.00	444.00	.	.	.	.	424.00	545.00
N	5	5	4	1	0	0	0	5	5
AVG	649.7	2496.6	1319.75	3300	#DIV/0!	#DIV/0!	#DIV/0!	3148	994.4
SEM	269.81242	1497.1367	911.48819	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1707.5361	334.80421

Table 11: High Frequency Total Peripheral Resistance Spectral Power $(mmHg/L/min)^2$

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	165.00	323.00	209.00	862.00	668.00	288.00	.	942.00	426.00
D_HPB	63.30	90.00	210.00	275.00	.	.	.	325.00	241.00
G_HPB	54.60	138.00	353.00	1070.00	955.00	404.00	244.00	247.00	121.00
I_HPB	48.60	353.00	47.40	.	.	.	.	50.60	48.20
J_HPB	210.00	352.00	251.00	277.00	.	.	.	394.00	364.00
K_HPB	120.00	236.00	181.00	.	.	.	.	151.00	321.00
L_HPB	36.00	157.00	512.00	.	.	.	.	.	25.30
N	7	7	7	4	2	2	1	6	7
AVG	99.642857	235.57143	251.91429	621	811.5	346	244	351.6	220.92857
SEM	25.29357	41.367607	55.273585	203.66107	143.5	58	#DIV/0!	128.17436	59.966716

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	64.51	93.42	.	.	.	93.23	.	93.23	161.48
D_HPA	93.30	174.00	396.00	425.00	1670.00	.	.	1460.00	71.40
G_HPA	70.00	127.00	186.00	312.00	280.00	170.00	69.80	152.00	129.00
I_HPA	43.60	40.80	60.50	25.90	.	.	.	35.80	39.30
J_HPA	131.00	486.00	473.00	759.00	447.00	327.00	.	419.00	491.00
K_HPA	101.00	142.00	79.50	217.00	.	.	.	199.00	168.00
L_HPA	.	.	.	.	.	.	.	.	.
N	6	6	5	5	3	3	1	6	6
AVG	83.901738	177.20325	239	347.78	799	196.7445	69.8	393.17225	176.69653
SEM	12.639139	64.485371	83.521404	121.87189	438.16017	68.794729	#DIV/0!	220.02527	66.164944

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	107.00	282.00	843.00	1630.00	.	.	.	1670.00	113.00
C_PSB	286.00	459.00	377.00	1410.00	442.00	576.00	658.00	602.00	153.00
E_PSB	106.00	98.50	163.00	190.00	148.00	.	.	244.00	116.00
F_PSB	176.00	131.00	142.00	176.00	.	.	.	276.00	139.00
M_PSB	156.00	83.30	133.00	.	.	.	.	164.00	131.00
N_PSB	17.00	104.00	.	.	.	.	.	90.30	24.80
O_PSB	40.70	105.00	139.00	195.00	.	.	.	164.00	112.00
N	7	7	6	5	2	1	1	7	7
AVG	126.95714	180.4	299.5	720.2	295	576	658	458.61429	112.68571
SEM	34.125705	53.013704	115.22724	328.37941	147	#DIV/0!	#DIV/0!	211.38279	15.72725

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	119.00	230.00	290.00	618.00	405.00	.	247.00	77.20	0.00
C_PSA	361.00	270.00	452.00	852.00	596.00	704.00	572.00	874.00	572.00
E_PSA	55.30	89.50	72.80	130.00	127.00	.	.	175.00	36.30
F_PSA	82.50	143.00	163.00	114.00	122.00	.	.	118.00	210.00
M_PSA	191.00	42.70	70.30	.	.	.	.	93.90	191.00
N_PSA	28.70	58.20	112.00	59.60	.	.	.	126.00	6.64
O_PSA	58.90	88.60	158.00	151.00	.	.	.	164.00	86.90
N	7	7	7	6	4	1	2	7	7
AVG	128.05714	131.71429	188.3	320.76667	312.5	704	409.5	232.58571	157.54857
SEM	43.733451	33.050887	52.218565	134.99749	115.3361	#DIV/0!	162.5	107.71449	76.052539

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	717.00	269.00	191.00	.	.	.	.	262.00	600.00
GWHPB	64.40	597.00	2190.00	.	.	.	.	1100.00	154.00
HWHPB	70.80	91.30	24.30	.	.	.	.	185.00	72.70
KWHPB	258.00	513.00	226.00	924.00	.	.	.	542.00	85.30
LWHPB	64.60	133.00	245.00	.	.	.	.	154.00	66.50
NWHPB	85.50	42.20	241.00	225.00	120.00	.	.	185.00	86.90
N	6	6	6	2	1	0	0	6	6
AVG	210.05	274.25	519.55	574.5	120	#DIV/0!	#DIV/0!	404.66667	177.56667
SEM	105.91984	94.598477	335.79559	349.5	#DIV/0!	#DIV/0!	#DIV/0!	150.78056	85.454025

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	100.00	232.00	510.00	879.00	.	.	.	628.00	212.00
GWHPA	66.30	436.00	682.00	847.00	.	.	.	728.00	44.60
HWHPA	66.30	56.70	81.40	95.40	.	.	.	115.00	99.60
KWHPA	170.00	301.00	388.00	710.00	.	.	.	605.00	124.00
LWHPA	138.00	805.00	1400.00	.	.	.	.	1380.00	77.20
NWHPA	67.30	741.00	45.70	122.00	282.00	.	.	298.00	217.00
N	6	6	6	5	1	0	0	6	6
AVG	101.31667	428.61667	517.85	530.68	282	#DIV/0!	#DIV/0!	625.66667	129.06667
SEM	17.957606	120.07892	202.93437	174.64662	#DIV/0!	#DIV/0!	#DIV/0!	177.77039	29.056803

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	114.00	119.00	267.00	.	.	.	.	183.00	53.40
BWPSB	423.00	735.00	.	.	.	.	.	732.00	311.00
DWPSB	1540.00	1970.00	.	.	.	.	.	2060.00	393.00
FWPSB	666.00	1650.00	1250.00	4760.00	640.00	.	.	3950.00	511.00
IWPSB	762.00	461.00	417.00	.	.	.	.	502.00	443.00
N	5	5	3	1	1	0	0	5	5
AVG	701	987	644.66667	4760	640	#DIV/0!	#DIV/0!	1485.4	342.28
SEM	237.773	353.51535	305.74844	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	694.09478	79.250731

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	34.60	77.40	68.30	.	.	.	.	72.10	86.00
BWPSA	133.00	828.00	740.00	.	.	.	.	850.00	186.00
DWPSA	402.00	2370.00	.	.	.	.	.	2490.00	561.00
FWPSA	287.00	329.00	589.00	982.00	.	.	.	831.00	491.00
IWPSA	399.00	184.00	164.00	.	.	.	.	295.00	198.00
N	5	5	4	1	0	0	0	5	5
AVG	251.12	757.68	390.325	982	#DIV/0!	#DIV/0!	#DIV/0!	907.62	304.4
SEM	73.059526	423.09437	162.44678	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	423.46866	93.193669

Table 12: Stroke Volume Means (mL)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	127.00	92.90	91.80	71.20	54.50	50.70	.	52.50	147.00
D_HPB	116.00	93.60	85.50	76.00	.	.	.	78.20	108.00
G_HPB	132.00	92.10	76.00	65.50	61.90	61.60	55.30	56.30	146.00
I_HPB	169.00	76.00	103.00	.	.	.	.	103.00	233.00
J_HPB	83.60	69.80	60.60	50.70	.	.	.	57.20	89.10
K_HPB	131.00	66.20	53.40	.	.	.	.	55.70	114.00
L_HPB	205.00	114.00	85.50	.	.	.	.	93.00	230.00
N	7	7	7	4	2	2	1	7	7
AVG	137.65714	86.371429	79.4	65.85	58.2	56.15	55.3	70.842857	152.44286
SEM	14.718418	6.3247328	6.5939005	5.4870302	3.7	5.45	#DIV/0!	7.7805269	21.844165

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	183.00	137.00	132.00	132.00	113.00	99.30	.	105.00	207.00
D_HPA	93.50	71.10	66.00	62.20	48.00	.	.	51.20	88.60
G_HPA	156.00	93.10	76.60	71.60	61.90	58.80	57.50	58.30	138.00
I_HPA	173.00	124.00	112.00	115.00	.	.	.	114.00	217.00
J_HPA	106.00	91.30	71.40	64.20	60.20	59.10	.	59.50	105.00
K_HPA	136.00	86.70	73.00	69.40	.	.	.	69.90	146.00
L_HPA	189.00	114.00	93.20	.	.	.	.	98.10	261.00
N	7	7	7	6	4	3	1	7	7
AVG	148.07143	102.45714	89.171429	85.733333	70.775	72.4	57.5	79.428571	166.08571
SEM	14.203633	8.7751504	9.3145486	12.221802	14.41136	13.450279	#DIV/0!	9.6718963	24.005311

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	116.00	71.10	60.30	48.20	47.80	.	.	47.40	125.00
C_PSB	106.00	78.80	73.20	67.30	63.70	57.70	47.50	51.50	95.70
E_PSB	125.00	109.00	90.10	79.60	62.40	.	.	69.30	119.00
F_PSB	64.30	53.40	49.10	46.70	.	.	.	47.40	76.60
M_PSB	97.30	75.20	61.40	.	.	.	.	67.40	116.00
N_PSB	145.00	85.70	.	.	.	.	.	85.50	171.00
O_PSB	173.00	127.00	96.60	74.00	.	.	.	77.40	111.00
N	7	7	6	5	3	1	1	7	7
AVG	118.08571	85.742857	71.783333	63.16	57.966667	57.7	47.5	63.7	116.32857
SEM	13.150347	9.3387023	7.5445087	6.7069069	5.097167	#DIV/0!	#DIV/0!	5.74912	11.023454

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	116.00	83.90	68.10	55.30	51.20	.	.	51.80	134.00
C_PSA	97.00	76.40	69.50	64.80	59.30	51.00	47.00	47.30	85.00
E_PSA	140.00	125.00	106.00	89.60	81.90	.	.	84.10	176.00
F_PSA	93.90	68.50	58.80	54.90	46.30	.	.	48.50	97.90
M_PSA	113.00	95.50	77.70	.	.	.	.	84.10	119.00
N_PSA	143.00	108.00	96.60	83.60	.	.	.	88.00	169.00
O_PSA	197.00	125.00	95.70	81.90	.	.	.	82.60	175.00
N	7	7	7	6	4	1	1	7	7
AVG	128.55714	97.471429	81.771429	71.683333	59.675	51	47	69.485714	136.55714
SEM	13.470105	8.5883563	6.6951907	6.2312875	7.8782797	#DIV/0!	#DIV/0!	7.2165626	14.270714

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	90.00	71.80	60.10	.	.	.	.	63.60	102.00
GWHPB	155.00	74.40	59.50	.	.	.	.	66.80	184.00
HWHPB	118.00	92.50	83.90	.	.	.	.	87.60	149.00
KWHPB	95.20	71.80	68.70	57.60	.	.	.	60.50	100.00
LWHPB	137.00	85.20	57.00	.	.	.	.	77.10	138.00
NWHPB	115.00	96.20	64.00	57.20	49.90	.	.	51.60	105.00
N	6	6	6	2	1	0	0	6	6
AVG	118.36667	81.983333	65.533333	57.4	49.9	#DIV/0!	#DIV/0!	67.866667	129.66667
SEM	10.069812	4.4270695	4.0350685	0.2	#DIV/0!	#DIV/0!	#DIV/0!	5.2053605	13.72265

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	87.30	76.90	52.40	41.50	.	.	.	46.90	123.00
GWHPA	134.00	76.50	54.20	42.20	.	.	.	51.10	149.00
HWHPA	150.00	115.00	83.00	68.60	.	.	.	77.00	185.00
KWHPA	136.00	86.70	73.00	69.40	.	.	.	69.90	146.00
LWHPA	109.00	66.00	52.60	.	.	.	.	56.20	115.00
NWHPA	126.00	68.40	64.10	61.90	52.20	.	.	54.00	114.00
N	6	6	6	5	1	0	0	6	6
AVG	123.71667	81.583333	63.216667	56.72	52.2	#DIV/0!	#DIV/0!	59.183333	138.66667
SEM	9.1203222	7.3195363	5.1603887	6.2097826	#DIV/0!	#DIV/0!	#DIV/0!	4.7758711	11.137524

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	106.00	71.70	57.20	.	.	.	.	61.50	104.00
BWPSB	85.20	61.30	.	.	.	.	.	61.00	98.60
DWPSB	77.40	57.70	.	.	.	.	.	56.10	79.00
FWPSB	84.60	66.30	53.00	45.70	42.80	.	.	44.60	87.40
IWPSB	103.00	65.90	64.00	.	.	.	.	63.70	117.00
N	5	5	3	1	1	0	0	5	5
AVG	91.24	64.58	58.066667	45.7	42.8	#DIV/0!	#DIV/0!	57.38	97.2
SEM	5.6047837	2.3820999	3.2048574	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	3.4277398	6.5860459

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	118.00	70.70	60.20	.	.	.	.	66.70	118.00
BWPSA	99.50	50.20	32.00	.	.	.	.	44.70	104.00
DWPSA	89.80	47.10	.	.	.	.	.	46.50	94.20
FWPSA	75.70	58.50	51.50	46.00	.	.	.	47.40	95.50
IWPSA	111.00	65.10	54.00	.	.	.	.	61.50	120.00
N	5	5	4	1	0	0	0	5	5
AVG	98.8	58.32	49.425	46	#DIV/0!	#DIV/0!	#DIV/0!	53.36	106.34
SEM	7.5252242	4.4220357	6.0893863	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	4.4821423	5.4447773

Table 13: Low Frequency Stroke Volume Spectral Power (mL^2)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	20700.00	33000.00	8440.00	31000.00	2160.00	2120.00	.	3700.00	66500.00
D_HPB	42000.00	11200.00	18900.00	13300.00	.	.	.	15600.00	18800.00
G_HPB	11200.00	10200.00	11500.00	4550.00	2290.00	3350.00	1110.00	1510.00	11800.00
I_HPB	39100.00	11500.00	9910.00	.	.	.	.	13800.00	55500.00
J_HPB	7080.00	10000.00	4920.00	957.00	.	.	.	8420.00	12100.00
K_HPB	17500.00	4880.00	895.00	.	.	.	.	1050.00	10200.00
L_HPB	46100.00	19800.00	7420.00	.	.	.	.	.	32200.00
N	7	7	7	4	2	2	1	6	7
AVG	26240	14368.571	8855	12451.75	2225	2735	1110	7346.6667	29585.714
SEM	5993.1771	3523.3692	2127.4194	6704.004	65	615	#DIV/0!	2568.5789	8667.4934

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	85600.00	31100.00	15500.00	77900.00	49100.00	21900.00	.	41000.00	171000.00
D_HPA	13900.00	9050.00	7370.00	8140.00	12700.00	.	.	11900.00	7700.00
G_HPA	38700.00	5130.00	5010.00	7140.00	2810.00	1930.00	594.00	1550.00	17600.00
I_HPA	35600.00	10400.00	19500.00	13600.00	.	.	.	10100.00	66800.00
J_HPA	9650.00	12600.00	6470.00	4840.00	5660.00	4150.00	.	4080.00	14500.00
K_HPA	22000.00	8080.00	2060.00	6670.00	.	.	.	5730.00	13300.00
L_HPA	.	.	.	.	.	.	.	.	.
N	6	6	6	6	4	3	1	6	6
AVG	34241.667	12726.667	9318.3333	19715	17567.5	9326.6667	594	12393.333	48483.333
SEM	11295.71	3811.5068	2738.8166	11699.624	10714.334	6319.2466	#DIV/0!	5929.9622	26048.435

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	12100.00	11300.00	9770.00	2720.00	2470.00	.	.	2340.00	28000.00
C_PSB	39400.00	7190.00	3660.00	5670.00	2510.00	1580.00	5450.00	4870.00	8940.00
E_PSB	20500.00	22100.00	22400.00	20600.00	10400.00	.	.	12100.00	36200.00
F_PSB	2560.00	1860.00	1710.00	1660.00	.	.	.	1990.00	10600.00
M_PSB	12200.00	6810.00	7570.00	.	.	.	.	11600.00	63200.00
N_PSB	8210.00	3850.00	.	.	.	.	.	3380.00	5480.00
O_PSB	50200.00	43200.00	16100.00	8000.00	.	.	.	11100.00	8040.00
N	7	7	6	5	3	1	1	7	7
AVG	20738.571	13758.571	10201.667	7730	5126.6667	1580	5450	6768.5714	22922.857
SEM	6639.0606	5506.7195	3191.674	3405.1314	2636.692	#DIV/0!	#DIV/0!	1746.1665	8014.0263

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	9960.00	14300.00	3370.00	3690.00	2290.00	.	.	3110.00	8540.00
C_PSA	41400.00	4130.00	4780.00	4080.00	7320.00	7650.00	13000.00	18800.00	30300.00
E_PSA	17500.00	19800.00	13600.00	17100.00	12400.00	.	.	19700.00	31200.00
F_PSA	9850.00	3930.00	2680.00	1460.00	911.00	.	.	1510.00	18200.00
M_PSA	15500.00	14200.00	19400.00	.	.	.	.	16900.00	34700.00
N_PSA	18000.00	5340.00	7880.00	11800.00	.	.	.	6470.00	21600.00
O_PSA	63500.00	16800.00	14800.00	9810.00	.	.	.	11300.00	30500.00
N	7	7	7	6	4	1	1	7	7
AVG	25101.429	11214.286	9501.4286	7990	5730.25	7650	13000	11112.857	25005.714
SEM	7563.0085	2493.3529	2449.0138	2430.635	2615.2336	#DIV/0!	#DIV/0!	2862.6243	3517.3088

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	12000.00	9580.00	9810.00	.	.	.	.	14800.00	45400.00
GWHPB	14800.00	7740.00	4800.00	.	.	.	.	8110.00	31600.00
HWHPB	18900.00	11300.00	8710.00	.	.	.	.	14700.00	36600.00
KWHPB	12400.00	18000.00	11800.00	6600.00	.	.	.	6670.00	25500.00
LWHPB	6870.00	9620.00	2390.00	.	.	.	.	5870.00	9310.00
NWHPB	10900.00	3640.00	4290.00	3660.00	1230.00	.	.	1980.00	13600.00
N	6	6	6	2	1	0	0	6	6
AVG	12645	9980	6966.6667	5130	1230	#DIV/0!	#DIV/0!	8688.3333	27001.667
SEM	1639.5197	1928.4329	1497.6619	1470	#DIV/0!	#DIV/0!	#DIV/0!	2088.4243	5617.3128

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	6520.00	25200.00	7820.00	7690.00	.	.	.	9490.00	53300.00
GWHPA	27100.00	7480.00	4520.00	4670.00	.	.	.	5050.00	6470.00
HWHPA	17100.00	42600.00	13600.00	7940.00	.	.	.	11400.00	108000.00
KWHPA	22000.00	8080.00	2060.00	6670.00	.	.	.	5730.00	13300.00
LWHPA	18100.00	2190.00	3900.00	.	.	.	.	5530.00	18200.00
NWHPA	13900.00	2980.00	3100.00	3530.00	1500.00	.	.	2410.00	43000.00
N	6	6	6	5	1	0	0	6	6
AVG	17453.333	14755	5833.3333	6100	1500	#DIV/0!	#DIV/0!	6601.6667	40378.333
SEM	2866.1085	6528.0246	1745.8497	862.79777	#DIV/0!	#DIV/0!	#DIV/0!	1332.3223	15407.165

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	8560.00	9320.00	2410.00	.	.	.	.	2090.00	12100.00
BWPSB	8730.00	7010.00	.	.	.	.	.	6750.00	17800.00
DWPSB	9590.00	4140.00	.	.	.	.	.	2550.00	5800.00
FWPSB	20200.00	19600.00	13000.00	6630.00	3870.00	.	.	7340.00	14600.00
IWPSB	21200.00	17400.00	3110.00	.	.	.	.	17000.00	27900.00
N	5	5	3	1	1	0	0	5	5
AVG	13656	11494	6173.3333	6630	3870	#DIV/0!	#DIV/0!	7146	15640
SEM	2885.3329	2995.8465	3419.3095	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	2683.115	3642.8835

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	10900.00	5240.00	2580.00	.	.	.	.	3180.00	47191.87
BWPSA	6850.00	7250.00	.	.	.	.	.	7800.00	23700.00
DWPSA	10900.00	4890.00	.	.	.	.	.	2750.00	12200.00
FWPSA	11200.00	6750.00	7590.00	6550.00	.	.	.	9140.00	21100.00
IWPSA	18000.00	7800.00	6010.00	.	.	.	.	8170.00	31500.00
N	5	5	3	1	0	0	0	5	5
AVG	11570	6386	5393.3333	6550	#DIV/0!	#DIV/0!	#DIV/0!	6208	27138.374
SEM	1798.0267	566.99735	1478.7645	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1343.6346	5884.751

Table 14: High Frequency Stroke Volume Spectral Power (mL^2)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	6320.00	4730.00	6270.00	11000.00	3350.00	3860.00	.	3380.00	9410.00
D_HPB	3740.00	2440.00	4800.00	3560.00	.	.	.	3580.00	2350.00
G_HPB	2470.00	1880.00	3610.00	4630.00	3770.00	3320.00	2020.00	2030.00	5100.00
I_HPB	9360.00	3610.00	9310.00	.	.	.	.	5600.00	9600.00
J_HPB	2030.00	2110.00	1220.00	439.00	.	.	.	1110.00	3150.00
K_HPB	3360.00	1420.00	907.00	.	.	.	.	701.00	4600.00
L_HPB	7740.00	5070.00	21000.00	.	.	.	.	.	5310.00
N	7	7	7	4	2	2	1	6	7
AVG	5002.8571	3037.1429	6731	4907.25	3560	3590	2020	2733.5	5645.7143
SEM	1066.3527	545.47364	2619.6493	2216.9576	210	270	#DIV/0!	744.15651	1073.4964

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	18900.00	7360.00	6680.00	10300.00	6390.00	9110.00	.	7180.00	30300.00
D_HPA	5370.00	2780.00	4320.00	6160.00	18900.00	.	.	17400.00	1560.00
G_HPA	10200.00	3620.00	4410.00	6710.00	3350.00	1980.00	701.00	1710.00	7010.00
I_HPA	7370.00	4340.00	9790.00	6400.00	.	.	.	6780.00	8780.00
J_HPA	3040.00	1570.00	1620.00	2900.00	3170.00	4600.00	.	4100.00	4820.00
K_HPA	7080.00	1960.00	797.00	3200.00	.	.	.	2530.00	4850.00
L_HPA	.	.	.	.	.	.	.	.	.
N	6	6	6	6	4	3	1	6	6
AVG	8660	3605	4602.8333	5945	7952.5	5230	701	6616.6667	9553.3333
SEM	2264.2011	859.6191	1350.5574	1104.7104	3723.176	2082.2184	#DIV/0!	2336.1944	4265.7939

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	4660.00	4230.00	5340.00	6030.00	5330.00	.	.	6490.00	4010.00
C_PSB	12300.00	2980.00	2220.00	5010.00	2910.00	2910.00	4990.00	4210.00	3390.00
E_PSB	10600.00	7360.00	11500.00	10100.00	8480.00	.	.	11500.00	7990.00
F_PSB	754.00	543.00	998.00	872.00	.	.	.	990.00	462.00
M_PSB	3000.00	2110.00	5340.00	.	.	.	.	4230.00	6150.00
N_PSB	1990.00	2470.00	.	.	.	.	.	2490.00	7950.00
O_PSB	20500.00	16400.00	23900.00	13400.00	.	.	.	14700.00	10100.00
N	7	7	6	5	3	1	1	7	7
AVG	7686.2857	5156.1429	8216.3333	7082.4	5573.3333	2910	4990	6372.8571	5721.7143
SEM	2697.4031	2039.1997	3470.6714	2156.2634	1612.517	#DIV/0!	#DIV/0!	1883.2858	1248.7579

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	3620.00	3730.00	2510.00	2160.00	1880.00	.	.	1040.00	6400.00
C_PSA	12400.00	3180.00	3340.00	5490.00	4070.00	4290.00	4290.00	6000.00	9850.00
E_PSA	4790.00	8630.00	7190.00	7910.00	8060.00	.	.	11500.00	8170.00
F_PSA	1480.00	859.00	811.00	638.00	528.00	.	.	479.00	2020.00
M_PSA	2570.00	2300.00	2190.00	.	.	.	.	2230.00	5740.00
N_PSA	4410.00	7350.00	15900.00	4650.00	.	.	.	11300.00	2910.00
O_PSA	48300.00	12400.00	18800.00	8210.00	.	.	.	9100.00	19100.00
N	7	7	7	6	4	1	1	7	7
AVG	11081.429	5492.7143	7248.7143	4843	3634.5	4290	4290	5949.8571	7741.4286
SEM	6345.8938	1551.6751	2730.1169	1239.3486	1645.7856	#DIV/0!	#DIV/0!	1807.5789	2157.6524

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	17900.00	7890.00	4120.00	.	.	.	.	6950.00	22900.00
GWHPB	6560.00	10600.00	22000.00	.	.	.	.	14500.00	11400.00
HWHPB	4470.00	5430.00	1330.00	.	.	.	.	6870.00	8980.00
KWHPB	3480.00	5260.00	2470.00	7950.00	.	.	.	5120.00	3690.00
LWHPB	2880.00	7130.00	9740.00	.	.	.	.	8770.00	3350.00
NWHPB	4470.00	2890.00	3470.00	2180.00	1690.00	.	.	2510.00	3340.00
N	6	6	6	2	1	0	0	6	6
AVG	6626.6667	6533.3333	7188.3333	5065	1690	#DIV/0!	#DIV/0!	7453.3333	8943.3333
SEM	2311.8098	1077.759	3192.2818	2885	#DIV/0!	#DIV/0!	#DIV/0!	1651.9053	3115.0459

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	2580.00	7970.00	7250.00	8830.00	.	.	.	6900.00	13400.00
GWHPA	6980.00	9680.00	8610.00	6230.00	.	.	.	9040.00	6500.00
HWHPA	8430.00	11400.00	3440.00	3260.00	.	.	.	5420.00	11100.00
KWHPA	7080.00	1960.00	797.00	3200.00	.	.	.	2530.00	4850.00
LWHPA	4430.00	6980.00	25100.00	.	.	.	.	18800.00	3140.00
NWHPA	5350.00	1450.00	1330.00	2840.00	5740.00	.	.	6010.00	7570.00
N	6	6	6	5	1	0	0	6	6
AVG	5808.3333	6573.3333	7754.5	4872	5740	#DIV/0!	#DIV/0!	8116.6667	7760
SEM	864.00392	1659.2723	3697.5158	1162.6066	#DIV/0!	#DIV/0!	#DIV/0!	2304.9753	1574.8164

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	2010.00	1590.00	3370.00	.	.	.	.	2140.00	2860.00
BWPSB	3090.00	3760.00	.	.	.	.	.	3700.00	2820.00
DWPSB	1470.00	1060.00	.	.	.	.	.	814.00	1020.00
FWPSB	8050.00	11800.00	4470.00	3790.00	2050.00	.	.	3570.00	4740.00
IWPSB	2850.00	5110.00	9010.00	.	.	.	.	5340.00	3560.00
N	5	5	3	1	1	0	0	5	5
AVG	3494	4664	5616.6667	3790	2050	#DIV/0!	#DIV/0!	3112.8	3000
SEM	1175.4557	1928.431	1726.126	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	766.32489	604.71481

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	3790.00	2530.00	1770.00	.	.	.	.	2740.00	7359.93
BWPSA	5700.00	4870.00	.	.	.	.	.	5150.00	2490.00
DWPSA	2530.00	1180.00	.	.	.	.	.	1080.00	1830.00
FWPSA	2090.00	1880.00	2520.00	3040.00	.	.	.	2720.00	5760.00
IWPSA	2290.00	3250.00	2260.00	.	.	.	.	5120.00	2710.00
N	5	5	3	1	0	0	0	5	5
AVG	3280	2742	2183.3333	3040	#DIV/0!	#DIV/0!	#DIV/0!	3362	4029.9858
SEM	673.6171	633.01975	219.8737	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	784.03061	1073.2038

Table 15: Cardiac Output Means (L/min)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	8.77	7.28	8.91	8.41	7.55	7.71	.	7.60	8.22
D_HPB	7.27	6.99	7.10	7.38	.	.	.	7.36	6.25
G_HPB	7.68	5.92	5.59	5.55	5.78	6.70	6.84	6.81	7.86
I_HPB	11.40	5.59	10.20	.	.	.	.	9.46	13.50
J_HPB	4.78	4.41	4.39	4.15	.	.	.	4.33	4.84
K_HPB	8.09	5.26	4.93	.	.	.	.	4.90	7.37
L_HPB	10.40	7.23	7.41	.	.	.	.	7.11	10.50
N	7	7	7	4	2	2	1	7	7
AVG	8.3414286	6.0971429	6.9328571	6.3725	6.665	7.205	6.84	6.7957143	8.3628571
SEM	0.8180797	0.4173483	0.8035597	0.9479133	0.885	0.505	#DIV/0!	0.6516677	1.0811297

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	11.80	10.40	11.30	12.60	12.10	11.50	.	11.60	13.20
D_HPA	6.55	5.87	6.09	6.29	5.66	.	.	5.82	5.28
G_HPA	10.10	7.26	6.90	7.61	7.63	8.34	8.45	8.37	8.77
I_HPA	11.30	9.65	10.40	12.20	.	.	.	11.90	12.70
J_HPA	6.16	5.61	5.13	5.18	5.64	6.56	.	6.19	6.63
K_HPA	8.72	6.66	6.45	7.15	.	.	.	6.98	8.47
L_HPA	9.58	7.84	8.31	.	.	.	.	8.11	12.70
N	7	7	7	6	4	3	1	7	7
AVG	9.1728571	7.6128571	7.7971429	8.505	7.7575	8.8	8.45	8.4242857	9.6785714
SEM	0.8253966	0.6909473	0.872265	1.2782925	1.520879	1.4444838	#DIV/0!	0.9274616	1.2109214

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	6.17	4.98	4.52	4.21	4.95	.	.	4.72	5.31
C_PSB	5.85	5.04	4.76	4.82	4.86	5.11	5.00	5.06	5.03
E_PSB	8.46	8.71	8.18	8.43	8.59	.	.	8.73	8.41
F_PSB	4.48	4.38	4.68	5.23	.	.	.	5.12	5.17
M_PSB	5.57	5.04	4.72	.	.	.	.	4.89	5.75
N_PSB	8.95	6.18	.	.	.	.	.	6.17	9.67
O_PSB	14.80	14.80	13.90	10.90	.	.	.	11.10	11.10
N	7	7	6	5	3	1	1	7	7
AVG	7.7542857	7.0185714	6.7933333	6.718	6.1333333	5.11	5	6.5414286	7.2057143
SEM	1.3201567	1.4062961	1.5329159	1.275278	1.2286081	#DIV/0!	#DIV/0!	0.9254122	0.9421249

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	6.31	5.15	4.74	4.71	5.54	.	.	5.24	6.91
C_PSA	6.63	5.90	5.88	6.02	6.04	5.70	6.17	6.00	5.60
E_PSA	9.07	8.76	8.21	8.58	9.13	.	.	8.97	10.40
F_PSA	5.32	4.57	4.79	5.10	5.23	.	.	5.25	5.75
M_PSA	5.86	5.80	5.32	.	.	.	.	5.58	6.05
N_PSA	10.70	9.61	9.95	9.39	.	.	.	9.30	12.40
O_PSA	15.50	11.40	12.20	10.60	.	.	.	10.60	13.40
N	7	7	7	6	4	1	1	7	7
AVG	8.4842857	7.3128571	7.2985714	7.4	6.485	5.7	6.17	7.2771429	8.6442857
SEM	1.3761417	0.9827312	1.0981704	1.0003833	0.8973154	#DIV/0!	#DIV/0!	0.8559281	1.2647922

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	6.72	6.76	7.51	.	.	.	.	7.41	7.26
GWHPB	10.30	6.59	6.98	.	.	.	.	6.85	11.20
HWHPB	7.39	7.53	8.96	.	.	.	.	8.02	9.01
KWHPB	7.11	6.43	7.28	7.13	.	.	.	7.10	6.85
LWHPB	8.37	7.34	7.20	.	.	.	.	7.34	7.50
NWHPB	6.65	6.33	5.43	5.93	6.32	.	.	6.27	5.90
N	6	6	6	2	1	0	0	6	6
AVG	7.7566667	6.83	7.2266667	6.53	6.32	#DIV/0!	#DIV/0!	7.165	7.9533333
SEM	0.5685283	0.2018745	0.4610543	0.6	#DIV/0!	#DIV/0!	#DIV/0!	0.2398715	0.7697864

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	5.10	5.15	4.48	4.39	.	.	.	4.44	6.36
GWHPA	9.05	6.11	6.21	5.69	.	.	.	6.05	8.70
HWHPA	9.06	8.73	8.24	8.58	.	.	.	8.42	10.70
KWHPA	7.90	6.43	6.99	7.42	.	.	.	7.21	7.66
LWHPA	6.90	5.56	6.13	.	.	.	.	5.92	6.62
NWHPA	7.43	5.35	5.68	6.78	6.91	.	.	6.90	6.44
N	6	6	6	5	1	0	0	6	6
AVG	7.5733333	6.2216667	6.2883333	6.572	6.91	#DIV/0!	#DIV/0!	6.49	7.7466667
SEM	0.6079675	0.5383209	0.5155154	0.7188004	#DIV/0!	#DIV/0!	#DIV/0!	0.5517367	0.6961354

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	6.48	5.23	5.18	.	.	.	.	5.21	6.68
BWPSB	4.87	4.77	.	.	.	.	.	4.76	5.13
DWPSB	4.06	3.73	.	.	.	.	.	3.65	3.71
FWPSB	5.36	4.52	4.11	4.17	4.57	.	.	4.28	4.72
IWPSB	5.78	5.28	6.27	.	.	.	.	5.49	6.68
N	5	5	3	1	1	0	0	5	5
AVG	5.31	4.706	5.1866667	4.17	4.57	#DIV/0!	#DIV/0!	4.678	5.384
SEM	0.4091699	0.2824288	0.6235472	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.328959	0.5773612

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	7.44	5.80	6.11	.	.	.	.	5.98	7.61
BWPSA	5.83	4.84	5.04	.	.	.	.	5.01	5.03
DWPSA	4.69	3.16	.	.	.	.	.	3.14	4.43
FWPSA	4.82	4.46	4.56	4.92	.	.	.	4.85	5.45
IWPSA	6.62	5.97	6.28	.	.	.	.	6.14	6.83
N	5	5	4	1	0	0	0	5	5
AVG	5.88	4.846	5.4975	4.92	#DIV/0!	#DIV/0!	#DIV/0!	5.024	5.87
SEM	0.5255188	0.5081889	0.4159001	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.5356921	0.5875713

Table 16: Low Frequency Cardiac Output Spectral Power $(L/min)^2$

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	191.00	281.00	152.00	611.00	92.70	46.10	.	189.00	547.00
D_HPB	136.00	89.40	92.00	142.00	.	.	.	288.00	112.00
G_HPB	73.20	72.50	145.00	73.20	34.90	32.80	18.80	17.30	87.00
I_HPB	275.00	145.00	152.00	.	.	.	.	158.00	266.00
J_HPB	27.20	34.50	25.90	8.43	.	.	.	52.20	42.90
K_HPB	120.00	27.70	8.81	.	.	.	.	10.20	40.10
L_HPB	164.00	89.10	107.00	.	.	.	.	.	210.00
N	7	7	7	4	2	2	1	6	7
AVG	140.91429	105.6	97.53	208.6575	63.8	39.45	18.8	119.11667	186.42857
SEM	30.471778	32.758656	22.52497	136.85835	28.9	6.65	#DIV/0!	45.322727	68.022604

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	663.00	267.00	229.00	627.00	592.00	280.00	.	484.00	1120.00
D_HPA	91.50	69.90	73.30	84.30	150.00	.	.	141.00	37.00
G_HPA	205.00	77.00	85.40	96.50	45.10	55.20	11.10	41.70	92.10
I_HPA	252.00	124.00	234.00	111.00	.	.	.	96.70	278.00
J_HPA	41.40	55.50	57.80	23.20	37.90	46.40	.	38.80	803.00
K_HPA	212.00	58.20	31.10	108.00	.	.	.	95.60	138.00
L_HPA	.	.	.	.	.	.	.	.	.
N	6	6	6	6	4	3	1	6	6
AVG	244.15	108.6	118.43333	175	206.25	127.2	11.1	149.63333	411.35
SEM	89.902331	33.258453	36.520484	91.345677	131.11006	76.442222	#DIV/0!	68.68546	181.67145

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	34.60	45.50	34.10	39.40	33.50	.	.	24.40	133.00
C_PSB	62.40	47.90	28.50	63.10	29.80	28.60	55.00	51.80	22.00
E_PSB	139.00	191.00	134.00	308.00	167.00	.	.	153.00	284.00
F_PSB	18.00	13.00	19.40	22.90	.	.	.	24.70	64.30
M_PSB	51.60	44.60	17.60	.	.	.	.	31.50	209.00
N_PSB	33.90	25.30	.	.	.	.	.	20.70	20.90
O_PSB	426.00	620.00	360.00	449.00	.	.	.	266.00	85.00
N	7	7	6	5	3	1	1	7	7
AVG	109.35714	141.04286	98.933333	176.48	76.766667	28.6	55	81.728571	116.88571
SEM	54.839766	82.921692	55.223894	85.673049	45.129308	#DIV/0!	#DIV/0!	35.428504	37.375319

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	51.30	51.40	22.60	30.30	31.20	.	.	19.90	27.90
C_PSA	199.00	51.70	36.50	49.80	93.80	142.00	237.00	272.00	128.00
E_PSA	94.00	122.00	76.10	125.00	140.00	.	.	189.00	137.00
F_PSA	38.90	25.20	16.50	11.80	9.29	.	.	14.00	95.60
M_PSA	126.00	30.40	58.20	.	.	.	.	105.00	150.00
N_PSA	86.60	113.00	106.00	107.00	.	.	.	115.00	121.00
O_PSA	400.00	218.00	335.00	205.00	.	.	.	227.00	218.00
N	7	7	7	6	4	1	1	7	7
AVG	142.25714	87.385714	92.985714	88.15	68.5725	142	237	134.55714	125.35714
SEM	47.38339	26.093791	42.040318	29.447034	29.790145	#DIV/0!	#DIV/0!	37.586927	21.67667

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	63.30	78.50	171.00	.	.	.	.	206.00	328.00
GWHPB	129.00	50.50	50.00	.	.	.	.	85.60	664.00
HWHPB	78.20	61.20	194.00	.	.	.	.	179.00	161.00
KWHPB	82.30	135.00	181.00	106.00	.	.	.	93.30	132.00
LWHPB	63.80	116.00	38.30	.	.	.	.	95.10	33.60
NWHPB	140.00	33.40	8.43	34.20	10.80	.	.	16.80	43.80
N	6	6	6	2	1	0	0	6	6
AVG	92.766667	79.1	107.12167	70.1	10.8	#DIV/0!	#DIV/0!	112.63333	227.06667
SEM	13.629543	16.035003	34.07132	35.9	#DIV/0!	#DIV/0!	#DIV/0!	28.117547	97.55627

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	32.80	75.60	38.20	60.90	.	.	.	50.10	196.00
GWHPA	159.00	74.80	54.70	82.30	.	.	.	66.60	60.50
HWHPA	87.00	221.00	154.00	113.00	.	.	.	175.00	656.00
KWHPA	83.10	36.80	111.00	169.00	.	.	.	100.00	106.00
LWHPA	120.00	53.40	59.70	.	.	.	.	89.30	82.00
NWHPA	119.00	33.30	29.60	47.90	23.70	.	.	25.30	285.00
N	6	6	6	5	1	0	0	6	6
AVG	100.15	82.483333	74.533333	94.62	23.7	#DIV/0!	#DIV/0!	84.383333	230.91667
SEM	17.523617	28.661873	19.66153	21.612251	#DIV/0!	#DIV/0!	#DIV/0!	21.183223	91.590066

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	184.00	44.00	19.30	.	.	.	.	17.50	47.70
BWPSB	69.10	35.60	.	.	.	.	.	37.80	95.90
DWPSB	96.00	21.80	.	.	.	.	.	23.10	24.60
FWPSB	79.80	75.40	44.20	87.80	54.40	.	.	76.40	47.70
IWPSB	221.00	121.00	43.30	.	.	.	.	156.00	213.00
N	5	5	3	1	1	0	0	5	5
AVG	129.98	59.56	35.6	87.8	54.4	#DIV/0!	#DIV/0!	62.16	85.78
SEM	30.481017	17.702813	8.1541401	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	25.614773	33.860381

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	54.80	36.30	14.90	.	.	.	.	34.90	224.11
BWPSA	44.50	61.90	40.00	.	.	.	.	64.50	51.00
DWPSA	77.90	39.60	.	.	.	.	.	43.30	50.70
FWPSA	47.80	30.70	65.50	114.00	.	.	.	127.00	283.00
IWPSA	151.00	47.30	74.70	.	.	.	.	60.50	182.00
N	5	5	4	1	0	0	0	5	5
AVG	75.2	43.16	48.775	114	#DIV/0!	#DIV/0!	#DIV/0!	66.04	158.162
SEM	19.827178	5.4005185	13.467082	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	16.180222	46.654952

Table 17: High Frequency Cardiac Output Spectral Power $(L/min)^2$

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	80.20	50.80	76.20	288.00	82.20	83.70	.	101.00	201.00
D_HPB	24.80	26.10	36.00	43.80	.	.	.	70.40	43.00
G_HPB	12.70	15.40	30.10	92.50	74.50	53.50	37.00	36.70	28.80
I_HPB	131.00	30.10	86.20	.	.	.	.	58.70	267.00
J_HPB	8.28	8.55	6.50	3.54	.	.	.	11.60	10.40
K_HPB	51.30	14.50	8.69	.	.	.	.	7.78	64.20
L_HPB	30.70	47.10	171.00	.	.	.	.	.	21.00
N	7	7	7	4	2	2	1	6	7
AVG	48.425714	27.507143	59.241429	106.96	78.35	68.6	37	47.696667	90.771429
SEM	16.616658	6.1919344	21.947355	63.027411	3.85	15.1	#DIV/0!	14.713935	38.223364

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	165.00	158.00	108.00	250.00	139.00	223.00	.	167.00	402.00
D_HPA	32.70	26.70	40.10	76.90	256.00	.	.	223.00	9.10
G_HPA	53.80	45.60	56.80	114.00	76.20	43.00	14.90	39.00	55.60
I_HPA	127.00	43.10	75.70	78.30	.	.	.	79.90	254.00
J_HPA	17.20	19.90	25.80	42.60	29.60	63.20	.	48.10	159.00
K_HPA	62.70	21.90	11.90	54.80	.	.	.	47.90	103.00
L_HPA	.	.	.	.	.	.	.	.	.
N	6	6	6	6	4	3	1	6	6
AVG	76.4	52.533333	53.05	102.76667	125.2	109.73333	14.9	100.81667	163.78333
SEM	23.46849	21.549148	14.318025	31.087175	49.023328	56.932748	#DIV/0!	31.169979	58.944688

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	14.60	15.10	36.20	49.40	61.20	.	.	67.10	43.10
C_PSB	22.20	16.90	11.60	45.20	17.60	37.10	60.70	49.00	10.80
E_PSB	58.10	53.40	101.00	109.00	148.00	.	.	172.00	68.10
F_PSB	9.36	5.86	10.60	17.60	.	.	.	28.30	13.70
M_PSB	19.40	7.89	15.90	.	.	.	.	13.60	23.10
N_PSB	11.20	11.60	.	.	.	.	.	10.10	23.10
O_PSB	141.00	421.00	554.00	328.00	.	.	.	346.00	115.00
N	7	7	6	5	3	1	1	7	7
AVG	39.408571	75.964286	121.55	109.84	75.6	37.1	60.7	98.014286	42.414286
SEM	18.048065	57.826366	87.612928	56.539381	38.325622	#DIV/0!	#DIV/0!	46.302234	14.225203

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	17.00	12.80	12.40	18.00	31.70	.	.	12.20	17.30
C_PSA	66.90	25.30	44.70	88.40	54.00	67.90	74.80	80.00	40.70
E_PSA	38.40	62.20	30.90	88.70	126.00	.	.	156.00	46.90
F_PSA	8.45	7.51	7.79	6.25	6.27	.	.	6.07	21.80
M_PSA	27.80	7.27	6.42	.	.	.	.	14.40	31.40
N_PSA	34.10	61.70	234.00	74.40	.	.	.	175.00	20.00
O_PSA	292.00	162.00	349.00	215.00	.	.	.	225.00	246.00
N	7	7	7	6	4	1	1	7	7
AVG	69.235714	48.397143	97.887143	81.791667	54.4925	67.9	74.8	95.524286	60.585714
SEM	37.782313	20.951718	51.799134	30.367972	25.752787	#DIV/0!	#DIV/0!	33.983477	31.182332

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	100.00	63.90	65.20	.	.	.	.	80.70	181.00
GWHPB	59.70	74.40	289.00	.	.	.	.	150.00	366.00
HWHPB	22.20	37.90	25.50	.	.	.	.	74.40	59.70
KWHPB	38.80	39.20	45.50	137.00	.	.	.	78.50	19.00
LWHPB	50.90	93.40	184.00	.	.	.	.	127.00	26.60
NWHPB	25.40	10.20	17.10	29.30	28.70	.	.	36.50	14.60
N	6	6	6	2	1	0	0	6	6
AVG	49.5	53.166667	104.38333	83.15	28.7	#DIV/0!	#DIV/0!	91.183333	111.15
SEM	11.685946	12.1916	44.446848	53.85	#DIV/0!	#DIV/0!	#DIV/0!	16.618211	56.990314

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	14.40	25.70	35.30	79.30	.	.	.	47.70	69.70
GWHPA	35.00	48.60	130.00	103.00	.	.	.	136.00	20.30
HWHPA	54.20	41.50	29.50	56.70	.	.	.	54.10	150.00
KWHPA	43.90	28.40	52.50	161.00	.	.	.	98.40	29.00
LWHPA	38.20	122.00	415.00	.	.	.	.	323.00	16.90
NWHPA	38.50	7.17	19.20	45.90	101.00	.	.	101.00	37.00
N	6	6	6	5	1	0	0	6	6
AVG	37.366667	45.561667	113.58333	89.18	101	#DIV/0!	#DIV/0!	126.7	53.816667
SEM	5.3575285	16.362025	62.439087	20.463172	#DIV/0!	#DIV/0!	#DIV/0!	41.470198	20.727107

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	67.10	10.40	30.80	.	.	.	.	21.30	21.30
BWPSB	23.60	26.70	.	.	.	.	.	25.90	19.90
DWPSB	29.50	17.90	.	.	.	.	.	15.50	10.30
FWPSB	31.70	47.60	20.30	67.70	62.10	.	.	55.60	14.70
IWPSB	122.00	52.30	94.60	.	.	.	.	48.70	125.00
N	5	5	3	1	1	0	0	5	5
AVG	54.78	30.98	48.566667	67.7	62.1	#DIV/0!	#DIV/0!	33.4	38.24
SEM	18.458424	8.1966701	23.215392	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	7.9056942	21.777732

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	24.30	14.40	17.10	.	.	.	.	14.30	40.45
BWPSA	23.70	36.20	44.40	.	.	.	.	36.00	13.30
DWPSA	16.70	14.10	.	.	.	.	.	15.50	26.90
FWPSA	17.80	16.00	25.40	76.40	.	.	.	57.10	77.20
IWPSA	120.00	32.70	41.00	.	.	.	.	67.60	71.10
N	5	5	4	1	0	0	0	5	5
AVG	40.5	22.68	31.975	76.4	#DIV/0!	#DIV/0!	#DIV/0!	38.1	45.79
SEM	19.933213	4.847618	6.4570859	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	10.753744	12.385742

Table 18: End Diastolic Volume Means (mL)

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	219.00	165.00	155.00	126.00	107.00	106.00	.	106.00	259.00
D_HPB	177.00	166.00	156.00	154.00	.	.	.	154.00	168.00
G_HPB	213.00	180.00	174.00	156.00	141.00	128.00	119.00	120.00	243.00
I_HPB	255.00	174.00	173.00	.	.	.	.	177.00	348.00
J_HPB	156.00	158.00	162.00	147.00	.	.	.	158.00	169.00
K_HPB	207.00	116.00	102.00	.	.	.	.	105.00	186.00
L_HPB	373.00	283.00	236.00	.	.	.	.	253.00	397.00
N	7	7	7	4	2	2	1	7	7
AVG	228.57143	177.42857	165.42857	145.75	124	117	119	153.28571	252.85714
SEM	26.852203	19.272306	14.915408	6.8602114	17	11	#DIV/0!	19.641688	34.040192

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	293.00	218.00	208.00	204.00	178.00	158.00	.	167.00	329.00
D_HPA	148.00	136.00	128.00	115.00	90.30	.	.	94.80	149.00
G_HPA	218.00	142.00	98.60	86.50	.	.	.	95.90	238.00
I_HPA	281.00	232.00	207.00	205.00	.	.	.	206.00	335.00
J_HPA	171.00	177.00	171.00	163.00	150.00	127.00	.	135.00	180.00
K_HPA	229.00	165.00	154.00	145.00	.	.	.	147.00	239.00
L_HPA	350.00	284.00	260.00	.	.	.	.	270.00	403.00
N	7	7	7	6	3	2	0	7	7
AVG	241.42857	193.42857	175.22857	153.08333	139.43333	142.5	#DIV/0!	159.38571	267.57143
SEM	26.906237	20.304652	20.610096	19.438114	25.86222	15.5	#DIV/0!	23.612047	34.530771

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	187.00	133.00	124.00	113.00	101.00	.	.	104.00	208.00
C_PSB	191.00	159.00	156.00	152.00	156.00	147.00	123.00	132.00	181.00
E_PSB	210.00	197.00	175.00	151.00	112.00	.	.	125.00	201.00
F_PSB	115.00	112.00	100.00	91.80	.	.	.	93.50	137.00
M_PSB	164.00	161.00	151.00	.	.	.	.	155.00	191.00
N_PSB	273.00	193.00	.	.	.	.	.	194.00	316.00
O_PSB	285.00	197.00	156.00	137.00	.	.	.	139.00	196.00
N	7	7	6	5	3	1	1	7	7
AVG	203.57143	164.57143	143.66667	128.96	123	147	123	134.64286	204.28571
SEM	22.538704	12.645076	11.005049	11.65511	16.802778	#DIV/0!	#DIV/0!	12.619295	20.597867

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	196.00	166.00	148.00	132.00	109.00	.	.	116.00	224.00
C_PSA	194.00	176.00	174.00	168.00	155.00	127.00	125.00	122.00	184.00
E_PSA	227.00	232.00	212.00	172.00	152.00	.	.	157.00	284.00
F_PSA	166.00	138.00	127.00	112.00	94.40	.	.	98.30	167.00
M_PSA	183.00	188.00	173.00	.	.	.	.	178.00	196.00
N_PSA	268.00	206.00	183.00	167.00	.	.	.	176.00	314.00
O_PSA	333.00	233.00	165.00	164.00	.	.	.	164.00	306.00
N	7	7	7	6	4	1	1	7	7
AVG	223.85714	191.28571	168.85714	152.5	127.6	127	125	144.47143	239.28571
SEM	22.122418	13.217438	10.126412	10.03909	15.259751	#DIV/0!	#DIV/0!	12.055363	23.105054

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	170.00	144.00	113.00	.	.	.	.	121.00	179.00
GWHPB	261.00	153.00	112.00	.	.	.	.	129.00	290.00
HWHPB	190.00	174.00	149.00	.	.	.	.	163.00	232.00
KWHPB	154.00	131.00	118.00	103.00	.	.	.	107.00	164.00
LWHPB	247.00	177.00	130.00	.	.	.	.	164.00	252.00
NWHPB	201.00	178.00	126.00	106.00	92.40	.	.	95.60	195.00
N	6	6	6	2	1	0	0	6	6
AVG	203.83333	159.5	124.66667	104.5	92.4	#DIV/0!	#DIV/0!	129.93333	218.66667
SEM	17.28085	8.0694899	5.6666667	1.5	#DIV/0!	#DIV/0!	#DIV/0!	11.603639	19.578333

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	145.00	145.00	118.00	94.20	.	.	.	106.00	192.00
GWHPA	218.00	142.00	98.60	86.50	.	.	.	95.90	238.00
HWHPA	237.00	226.00	173.00	140.00	.	.	.	159.00	283.00
KWHPA	229.00	165.00	154.00	145.00	.	.	.	147.00	239.00
LWHPA	195.00	134.00	106.00	.	.	.	.	114.00	214.00
NWHPA	216.00	184.00	119.00	108.00	95.00	.	.	96.60	204.00
N	6	6	6	5	1	0	0	6	6
AVG	206.66667	166	128.1	114.74	95	#DIV/0!	#DIV/0!	119.75	228.33333
SEM	13.630032	14.102009	11.874763	11.871293	#DIV/0!	#DIV/0!	#DIV/0!	10.969648	13.30831

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	167.00	126.00	106.00	.	.	.	.	113.00	163.00
BWPSB	149.00	118.00	.	.	.	.	.	118.00	165.00
DWPSB	129.00	118.00	.	.	.	.	.	118.00	135.00
FWPSB	135.00	120.00	108.00	117.00	82.30	.	.	104.00	137.00
IWPSB	181.00	145.00	139.00	0.00	0.00	0.00	0.00	144.00	204.00
N	5	5	3	2	2	1	1	5	5
AVG	152.2	125.4	117.66667	58.5	41.15	0	0	119.4	160.8
SEM	9.7283092	5.1146847	10.68228	58.5	41.15	#DIV/0!	#DIV/0!	6.6603303	12.491597

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	186.00	125.00	110.00	.	.	.	.	120.00	190.00
BWPSA	165.00	104.00	78.70	.	.	.	.	96.20	174.00
DWPSA	155.00	109.00	.	.	.	.	.	107.00	160.00
FWPSA	127.00	104.00	94.10	83.60	.	.	.	86.30	156.00
IWPSA	191.00	142.00	122.00	.	.	.	.	137.00	210.00
N	5	5	4	1	0	0	0	5	5
AVG	164.8	116.8	101.2	83.6	#DIV/0!	#DIV/0!	#DIV/0!	109.3	178
SEM	11.534297	7.3851202	9.4284145	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	8.9097699	9.97998

Table 19: Low Frequency End Diastolic Volume Spectral Power $(mL)^2$

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	64500.00	58700.00	29700.00	55300.00	3940.00	7190.00	.	7390.00	174000.00
D_HPB	88700.00	40000.00	24400.00	63100.00	.	.	.	63100.00	43400.00
G_HPB	25800.00	44600.00	144000.00	90900.00	14800.00	8280.00	4390.00	3490.00	33900.00
I_HPB	78200.00	144000.00	19100.00	.	.	.	.	24800.00	93600.00
J_HPB	20000.00	35600.00	54800.00	9210.00	.	.	.	68000.00	54500.00
K_HPB	29400.00	9720.00	23100.00	.	.	.	.	16200.00	9380.00
L_HPB	106000.00	81600.00	.	.	.	.	.	.	110000.00
N	7	7	6	4	2	2	1	6	7
AVG	58942.857	59174.286	49183.333	54627.5	9370	7735	4390	30496.667	74111.429
SEM	12900.127	16388.204	19664.611	16957.494	5430	545	#DIV/0!	11503.046	21145.999

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	172000.00	44300.00	31300.00	169000.00	72700.00	42000.00	.	75300.00	381000.00
D_HPA	45700.00	16600.00	43300.00	20700.00	31400.00	.	.	35100.00	21200.00
G_HPA	63800.00	22100.00	4420.00	12200.00	.	.	.	5680.00	13500.00
I_HPA	71000.00	25100.00	36500.00	17100.00	.	.	.	13900.00	125000.00
J_HPA	17700.00	30700.00	25000.00	49700.00	23100.00	13300.00	.	18200.00	37500.00
K_HPA	49600.00	20900.00	18300.00	30600.00	.	.	.	27300.00	46700.00
L_HPA	.	.	.	.	.	.	.	.	.
N	6	6	6	6	3	2	0	6	6
AVG	69966.667	26616.667	26470	49883.333	42400	27650	#DIV/0!	29246.667	104150
SEM	21745.017	4021.1455	5663.6002	24431.611	15338.296	14350	#DIV/0!	10119.119	57712.36

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	29300.00	28200.00	19600.00	19500.00	7960.00	.	.	11100.00	71000.00
C_PSB	118000.00	20400.00	10700.00	37700.00	7490.00	16200.00	132000.00	61100.00	22700.00
E_PSB	53300.00	65200.00	46400.00	36600.00	17900.00	.	.	21000.00	94756.76
F_PSB	20400.00	17800.00	5690.00	11500.00	.	.	.	13400.00	27300.00
M_PSB	24500.00	42500.00	48500.00	.	.	.	.	38300.00	151000.00
N_PSB	18400.00	16800.00	.	.	.	.	.	12100.00	11700.00
O_PSB	130000.00	90000.00	28000.00	20400.00	.	.	.	16800.00	23700.00
N	7	7	6	5	3	1	1	7	7
AVG	56271.429	40128.571	26481.667	25140	11116.667	16200	132000	24828.571	57450.966
SEM	18069.334	10573.613	7331.5848	5144.9587	3394.3793	#DIV/0!	#DIV/0!	6998.8337	19319.192

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	25800.00	35800.00	10100.00	9060.00	3620.00	.	.	8370.00	18300.00
C_PSA	134000.00	17300.00	15600.00	34800.00	80900.00	54200.00	100000.00	101000.00	87800.00
E_PSA	43900.00	70400.00	53600.00	36500.00	21800.00	.	.	43000.00	61700.00
F_PSA	15800.00	9540.00	5160.00	6410.00	1650.00	.	.	4800.00	32700.00
M_PSA	27200.00	44900.00	48300.00	.	.	.	.	53900.00	70100.00
N_PSA	47100.00	18000.00	16100.00	12100.00	.	.	.	15300.00	65100.00
O_PSA	184000.00	50900.00	27100.00	21500.00	.	.	.	23300.00	97500.00
N	7	7	7	6	4	1	1	7	7
AVG	68257.143	35262.857	25137.143	20061.667	26992.5	54200	100000	35667.143	61885.714
SEM	24397.247	8244.2447	7151.9793	5355.0564	18532.621	#DIV/0!	#DIV/0!	12836.213	10656.195

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	49200.00	33200.00	29500.00	.	.	.	.	40600.00	197000.00
GWHPB	51500.00	228000.00	8370.00	.	.	.	.	69900.00	83700.00
HWHPB	43300.00	27800.00	23700.00	.	.	.	.	50600.00	93200.00
KWHPB	30400.00	53200.00	19100.00	19700.00	.	.	.	16300.00	69100.00
LWHPB	18500.00	24500.00	20500.00	.	.	.	.	21600.00	22300.00
NWHPB	26000.00	9400.00	12600.00	17600.00	2130.00	.	.	4010.00	30000.00
N	6	6	6	2	1	0	0	6	6
AVG	36483.333	62683.333	18961.667	18650	2130	#DIV/0!	#DIV/0!	33835	82550
SEM	5489.3483	33567.21	3101.3335	1050	#DIV/0!	#DIV/0!	#DIV/0!	9956.9352	25681.391

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	13800.00	77600.00	18300.00	29400.00	.	.	.	27500.00	114000.00
GWHPA	63800.00	22100.00	4420.00	12200.00	.	.	.	5680.00	13500.00
HWHPA	35300.00	106000.00	57800.00	13700.00	.	.	.	36900.00	240000.00
KWHPA	49600.00	20900.00	18300.00	30600.00	.	.	.	27300.00	46700.00
LWHPA	57500.00	7240.00	4350.00	.	.	.	.	11500.00	56900.00
NWHPA	33600.00	7180.00	4700.00	6740.00	17000.00	.	.	17800.00	101000.00
N	6	6	6	5	1	0	0	6	6
AVG	42266.667	40170	17978.333	18528	17000	#DIV/0!	#DIV/0!	21113.333	95350
SEM	7491.1355	16936.328	8429.8005	4828.2693	#DIV/0!	#DIV/0!	#DIV/0!	4725.3407	32582.211

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	54500.00	22900.00	7300.00	.	.	.	.	7570.00	33700.00
BWPSB	23400.00	21800.00	.	.	.	.	.	21100.00	54000.00
DWPSB	23700.00	10600.00	.	.	.	.	.	8700.00	16400.00
FWPSB	54300.00	38900.00	.	141000.00	8150.00	.	.	175000.00	38000.00
IWPSB	52000.00	70100.00	56600.00	0.00	0.00	0.00	0.00	71100.00	94100.00
N	5	5	2	2	2	1	1	5	5
AVG	41580	32860	31950	70500	4075	0	0	56694	47240
SEM	7373.9677	10344.883	24650	70500	4075	#DIV/0!	#DIV/0!	31770.558	13155.554

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	22900.00	15400.00	2510.00	.	.	.	.	8610.00	135000.00
BWPSA	17200.00	16000.00	.	.	.	.	.	17500.00	62700.00
DWPSA	30000.00	42800.00	.	.	.	.	.	26300.00	34000.00
FWPSA	27700.00	24200.00	27400.00	75000.00	.	.	.	82300.00	47400.00
IWPSA	33200.00	54300.00	36400.00	.	.	.	.	56400.00	84000.00
N	5	5	3	1	0	0	0	5	5
AVG	26200	30540	22103.333	75000	#DIV/0!	#DIV/0!	#DIV/0!	38222	72620
SEM	2806.9556	7731.9855	10135.318	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	13641.326	17673.042

Table 20: High Frequency End Diastolic Volume Spectral Power $(mL)^2$

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPB	22800.00	17100.00	19300.00	28200.00	12600.00	16400.00	.	15700.00	23800.00
D_HPB	8470.00	9790.00	19400.00	32400.00	.	.	.	32400.00	10600.00
G_HPB	5860.00	11400.00	47500.00	72800.00	65200.00	35400.00	24900.00	24500.00	15300.00
I_HPB	20000.00	47500.00	25600.00	.	.	.	.	15700.00	24400.00
J_HPB	6970.00	9770.00	7990.00	6580.00	.	.	.	9010.00	11400.00
K_HPB	7930.00	2980.00	13000.00	.	.	.	.	6380.00	5640.00
L_HPB	25900.00	28300.00	.	.	.	.	.	.	14300.00
N	7	7	6	4	2	2	1	6	7
AVG	13990	18120	22131.667	34995	38900	25900	24900	17281.667	15062.857
SEM	3229.9034	5734.9111	5640.4376	13812.845	26300	9500	#DIV/0!	3970.468	2610.7924

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
A_HPA	39800.00	13300.00	15300.00	26500.00	18500.00	23200.00	.	19000.00	54200.00
D_HPA	15000.00	9760.00	21100.00	15200.00	51900.00	.	.	48800.00	4790.00
G_HPA	19200.00	30900.00	26700.00	22200.00	.	.	.	27600.00	15000.00
I_HPA	18000.00	26400.00	34700.00	25100.00	.	.	.	27600.00	17100.00
J_HPA	8840.00	6130.00	15900.00	15300.00	16500.00	20000.00	.	15900.00	15300.00
K_HPA	19700.00	5470.00	7530.00	23200.00	.	.	.	19300.00	13100.00
L_HPA	.	.	.	.	.	.	.	.	.
N	6	6	6	6	3	2	0	6	6
AVG	20090	15326.667	20205	21250	28966.667	21600	#DIV/0!	26366.667	19915
SEM	4267.1888	4404.449	3900.1656	1992.4441	11481.192	1600	#DIV/0!	4899.1609	7080.6091

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSB	10500.00	15100.00	20000.00	40000.00	17000.00	.	.	27200.00	11800.00
C_PSB	39500.00	12200.00	10600.00	25300.00	16600.00	19700.00	51400.00	29800.00	11800.00
E_PSB	24600.00	27800.00	30200.00	27800.00	22000.00	.	.	29000.00	20652.84
F_PSB	6270.00	9620.00	2790.00	8900.00	.	.	.	7410.00	1980.00
M_PSB	7510.00	15200.00	49100.00	.	.	.	.	32100.00	15900.00
N_PSB	6190.00	20000.00	.	.	.	.	.	21100.00	28400.00
O_PSB	71500.00	42200.00	56800.00	27400.00	.	.	.	30300.00	32100.00
N	7	7	6	5	3	1	1	7	7
AVG	23724.286	20302.857	28248.333	25880	18533.333	19700	51400	25272.857	17518.977
SEM	9235.087	4278.0512	8720.52	4970.0503	1737.1752	#DIV/0!	#DIV/0!	3260.4299	3934.942

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
B_PSA	8450.00	15300.00	16100.00	11700.00	6110.00	.	.	6880.00	15200.00
C_PSA	53500.00	23900.00	37800.00	48000.00	38100.00	36600.00	31600.00	36700.00	45800.00
E_PSA	12500.00	26400.00	31000.00	25500.00	25700.00	.	.	38600.00	24500.00
F_PSA	4930.00	4370.00	4040.00	3220.00	2010.00	.	.	1880.00	5650.00
M_PSA	6260.00	15500.00	13400.00	.	.	.	.	16300.00	17500.00
N_PSA	14500.00	32100.00	76800.00	20700.00	.	.	.	64100.00	10200.00
O_PSA	147000.00	33500.00	42500.00	29800.00	.	.	.	32200.00	53500.00
N	7	7	7	6	4	1	1	7	7
AVG	35305.714	21581.429	31662.857	23153.333	17980	36600	31600	28094.286	24621.429
SEM	19668.195	3945.9457	9169.9119	6328.7106	8467.3422	#DIV/0!	#DIV/0!	8127.0222	6883.1909

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPB	.	.	.	.	.	.	.	.	.
EWHPB	62800.00	32100.00	10900.00	.	.	.	.	16900.00	76000.00
GWHPB	22300.00	157000.00	81800.00	.	.	.	.	73000.00	30300.00
HWHPB	10600.00	24600.00	5960.00	.	.	.	.	26500.00	21000.00
KWHPB	8940.00	14600.00	6270.00	23200.00	.	.	.	14100.00	10000.00
LWHPB	7820.00	32000.00	55700.00	.	.	.	.	42800.00	10200.00
NWHPB	13100.00	7890.00	13200.00	5420.00	5850.00	.	.	9050.00	9940.00
N	6	6	6	2	1	0	0	6	6
AVG	20926.667	44698.333	28971.667	14310	5850	#DIV/0!	#DIV/0!	30391.667	26240
SEM	8638.3327	22800.83	13070.922	8890	#DIV/0!	#DIV/0!	#DIV/0!	9810.695	10498.743

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
CWHPA	.	.	.	.	.	.	.	.	.
EWHPA	6870.00	24800.00	22400.00	46800.00	.	.	.	26300.00	31500.00
GWHPA	19200.00	30900.00	26700.00	22200.00	.	.	.	27600.00	15000.00
HWHPA	18500.00	47400.00	12300.00	20200.00	.	.	.	29600.00	25400.00
KWHPA	19700.00	5470.00	7530.00	23200.00	.	.	.	19300.00	13100.00
LWHPA	13800.00	29100.00	95500.00	.	.	.	.	72400.00	8710.00
NWHPA	14000.00	5230.00	6070.00	7680.00	27100.00	.	.	25500.00	22100.00
N	6	6	6	5	1	0	0	6	6
AVG	15345	23816.667	28416.667	24016	27100	#DIV/0!	#DIV/0!	33450	19301.667
SEM	1998.3556	6626.4423	13825.935	6342.3226	#DIV/0!	#DIV/0!	#DIV/0!	7917.6912	3478.3525

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSB	11500.00	7180.00	11800.00	.	.	.	.	6870.00	8640.00
BWPSB	8000.00	14600.00	.	.	.	.	.	14900.00	6960.00
DWPSB	3820.00	4840.00	.	.	.	.	.	4140.00	2930.00
FWPSB	20900.00	28600.00	.	75400.00	16400.00	.	.	119000.00	11200.00
IWPSB	7500.00	32000.00	50800.00	0.00	0.00	0.00	0.00	32200.00	9990.00
N	5	5	2	2	2	1	1	5	5
AVG	10344	17444	31300	37700	8200	0	0	35422	7944
SEM	2906.1204	5516.4858	19500	37700	8200	#DIV/0!	#DIV/0!	21459.958	1438.4109

	Control	Tilt	-20 mmHg	-30 mmHg	-40 mmHg	-50 mmHg	-60 mmHg	Last 4 min	Recovery
AWPSA	8410.00	8000.00	6170.00	.	.	.	.	9050.00	15200.00
BWPSA	16100.00	22900.00	.	.	.	.	.	24300.00	6660.00
DWPSA	7830.00	8390.00	.	.	.	.	.	7030.00	7060.00
FWPSA	6070.00	7550.00	10400.00	26400.00	.	.	.	26400.00	15600.00
IWPSA	5530.00	23100.00	16900.00	.	.	.	.	31300.00	7130.00
N	5	5	3	1	0	0	0	5	5
AVG	8788	13988	11156.667	26400	#DIV/0!	#DIV/0!	#DIV/0!	19616	10330
SEM	1904.3119	3681.67	3120.5039	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	4870.9656	2072.3368

Appendix D: Amplitude and Phase of OLBNP Data

Table 21: Arterial Pressure Amplitudes (mmHg)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	3.830	2.740	2.400	2.900	4.250	3.290	3.270
D_HPB	5.690	3.850	3.610	1.240	2.130	2.830	2.960
G_HPB	0.370	3.100	3.620	3.180	2.090	1.450	1.970
I_HPB	3.510	8.310	4.450	1.920	1.630	2.880	3.920
J_HPB	7.860	2.130	3.150	4.140	2.020	2.380	3.090
K_HPB	0.988	1.960	3.070	2.460	5.800	5.020	4.260
L_HPB	2.770	5.400	3.440	2.200	2.280	1.260	2.830
N	7	7	7	7	7	7	7
AVG	3.574	3.9271429	3.3914286	2.5771429	2.8857143	2.73	3.1857143
SEM	0.9821782	0.8532507	0.2374209	0.3547616	0.5825186	0.4758951	0.2830519

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	9.190	1.060	1.620	3.350	3.800	3.700	2.340
D_HPA	3.320	0.960	5.220	1.330	0.655	2.930	2.570
G_HPA	2.330	4.970	6.520	4.750	1.220	1.920	2.740
I_HPA	2.840	1.880	3.200	2.180	1.950	4.390	2.640
J_HPA	4.980	4.210	1.410	1.820	1.730	1.650	1.470
K_HPA	1.940	0.806	2.830	0.587	2.550	2.880	4.680
L_HPA	.	.	.	.	.	.	.
N	6	6	6	6	6	6	6
AVG	4.1	2.3143333	3.4666667	2.3361667	1.9841667	2.9116667	2.74
SEM	1.1056974	0.7420109	0.8269126	0.6114796	0.4484723	0.4236147	0.4310994

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	3.210	1.020	2.810	1.560	3.220	1.650	2.020
C_PSB	2.020	3.560	5.530	1.860	4.030	2.480	3.300
E_PSB	3.000	4.120	5.810	1.200	2.030	3.840	4.310
F_PSB	2.000	2.340	2.070	3.430	4.660	3.220	2.700
M_PSB	.	3.300	5.350	.	.	0.738	2.350
N_PSB	6.060	4.160	6.140	3.630	2.050	2.510	3.680
O_PSB	1.670	7.650	10.700	11.000	4.800	3.480	1.410
N	6	7	7	6	6	7	7
AVG	2.9933333	3.7357143	5.4871429	3.78	3.465	2.5597143	2.8242857
SEM	0.6617334	0.7744917	1.0529883	1.5004955	0.5050066	0.4104899	0.3796418

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	1.310	3.190	3.370	3.200	3.490	3.660	2.400
C_PSA	5.630	1.100	6.610	4.590	2.540	1.525	2.900
E_PSA	3.560	4.770	1.740	1.980	3.100	4.350	4.380
F_PSA	1.970	4.110	4.450	5.190	5.680	3.750	2.450
M_PSA	1.590	2.460	1.870	1.480	2.010	1.010	2.100
N_PSA	0.904	0.241	4.280	1.334	2.920	3.700	3.820
O_PSA	1.880	3.800	5.890	4.560	5.000	3.830	3.260
N	7	7	7	7	7	7	7
AVG	2.4062857	2.8101429	4.03	3.1905908	3.5342857	3.117831	3.0442857
SEM	0.6232736	0.6230199	0.7020412	0.6108041	0.5031418	0.4888903	0.3129419

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	2.150	3.400	6.650	6.220	4.470	4.020	2.400
GWHPB	5.830	5.680	6.130	6.887	5.120	3.670	4.150
HWHPB	6.240	1.520	5.350	1.660	0.479	2.940	3.390
KWHPB	1.670	2.510	6.090	1.790	1.020	1.840	1.700
LWHPB	6.480	5.480	5.460	3.260	1.030	1.680	2.200
NWHPB	1.960	5.700	4.100	6.620	7.000	4.480	2.760
N	6	6	6	6	6	6	6
AVG	4.055	4.0483333	5.63	4.4061102	3.1865	3.105	2.7666667
SEM	0.9576316	0.7442957	0.3628682	1.0007224	1.1045866	0.4727632	0.3603486

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	6.550	2.700	3.870	1.830	1.360	2.060	1.530
GWHPA	4.640	3.940	4.920	2.530	2.370	3.400	3.710
HWHPA	3.320	0.394	2.290	4.170	5.400	3.990	3.980
KWHPA	1.830	4.050	6.810	4.660	4.520	3.930	3.700
LWHPA	2.950	5.040	6.830	3.200	1.530	1.450	3.400
NWHPA	1.650	5.000	5.340	6.200	6.140	3.520	3.270
N	6	6	6	6	6	6	6
AVG	3.49	3.5206667	5.01	3.765	3.5533333	3.0583333	3.265
SEM	0.7560379	0.716528	0.7157141	0.6450568	0.8434124	0.4297706	0.3617987

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	3.360	3.130	4.980	2.080	3.100	2.800	3.190
BWPSB	8.150	3.720	2.080	2.200	0.639	0.527	1.440
DWPSB	2.920	4.070	1.700	0.978	3.820	2.300	2.680
FWPSB	10.900	3.490	3.610	1.400	3.760	1.790	2.740
IWPSB	2.720	1.100	3.860	1.790	2.450	2.580	2.240
N	5	5	5	5	5	5	5
AVG	5.61	3.102	3.246	1.6896	2.7538	1.9994	2.458
SEM	1.6596144	0.5233679	0.6027404	0.2250826	0.5845404	0.4049832	0.2956755

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	0.654	1.360	3.590	1.640	1.020	3.400	3.290
BWPSA	5.590	3.430	3.220	1.060	1.840	1.950	2.980
DWPSA	5.670	7.960	0.285	4.720	3.110	2.920	2.400
FWPSA	8.540	4.300	9.960	5.340	1.830	1.680	3.210
IWPSA	0.853	1.050	2.190	3.640	3.210	3.950	3.010
N	5	5	5	5	5	5	5
AVG	4.2614	3.62	3.849	3.28	2.202	2.78	2.978
SEM	1.5278461	1.2459254	1.6318918	0.8385941	0.4187529	0.428474	0.1559295

Table 22: Arterial Pressure Phase Lags (degrees)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	109.435	214.469	157.173	182.201	171.887	191.368	189.076
D_HPB	206.447	241.971	269.863	313.981	82.506	172.070	172.643
G_HPB	292.964	182.201	161.757	223.636	190.404	166.913	176.081
I_HPB	199.389	187.930	192.514	255.539	164.048	118.602	137.510
J_HPB	186.211	315.127	154.308	203.010	195.952	181.628	156.027
K_HPB	260.878	203.973	162.330	158.709	161.001	176.654	170.924
L_HPB	174.752	170.351	181.237	207.411	207.984	191.941	208.557
N	7	7	7	7	7	7	7
AVG	204.29674	216.57441	182.7402	220.64089	167.68322	171.31075	172.97384
SEM	22.514959	18.682454	15.435856	19.357718	15.637403	9.462926	8.5694199

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	116.310	188.686	196.707	165.585	180.664	194.233	203.010
D_HPA	190.222	316.627	174.752	134.828	138.656	177.799	171.314
G_HPA	172.460	114.592	180.482	275.775	144.385	160.038	171.887
I_HPA	223.063	148.396	160.611	160.038	169.596	166.913	138.838
J_HPA	296.402	125.087	161.001	319.549	109.044	154.126	151.261
K_HPA	220.589	191.941	144.385	317.992	111.727	125.478	168.632
L_HPA	.	.	.	.	.	.	.
N	6	6	6	6	6	6	6
AVG	203.17437	180.88808	169.65634	228.96101	142.34535	163.09775	167.49042
SEM	24.526595	30.095809	7.461577	34.618054	11.937512	9.4959779	8.9091933

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	329.633	252.284	118.785	177.617	215.042	215.615	223.454
C_PSB	326.024	80.787	155.272	172.643	192.123	162.720	181.628
E_PSB	216.578	115.165	184.102	201.681	203.400	163.475	174.935
F_PSB	244.263	331.524	116.310	176.471	183.346	191.941	190.404
M_PSB	.	229.366	210.276	.	.	162.903	174.362
N_PSB	210.276	151.834	196.525	197.280	188.686	179.909	168.059
O_PSB	57.296	106.570	162.903	228.610	275.202	325.393	60.734
N	6	7	7	6	6	7	7
AVG	230.67812	181.07558	163.45304	192.38367	209.63324	200.27937	167.65352
SEM	40.720154	34.793774	13.799037	8.7249591	13.908978	22.111962	19.121534

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	38.331	54.259	142.849	169.023	198.999	193.842	193.842
C_PSA	220.016	5.483	163.475	206.838	283.614	257.738	158.709
E_PSA	194.988	185.065	196.134	146.104	184.492	176.081	178.372
F_PSA	228.220	88.235	172.643	196.707	199.389	196.134	187.357
M_PSA	97.403	224.026	176.471	211.604	158.709	179.518	166.340
N_PSA	309.179	242.361	182.383	277.728	162.903	156.600	170.924
O_PSA	155.272	96.830	166.340	227.647	214.859	210.458	189.832
N	7	7	7	7	7	7	7
AVG	177.62965	128.03724	171.47081	205.09294	200.42367	195.76734	177.91098
SEM	33.912623	34.00171	6.2928259	15.947139	15.836863	12.194584	4.9683598

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB							
EWHPB	232.803	166.731	196.134	351.692	61.306	111.727	151.261
GWHPB	182.201	210.276	173.033	261.152	280.359	108.289	106.180
HWHPB	188.113	203.400	199.572	143.812	134.645	173.033	164.621
KWHPB	10.657	105.997	189.832	264.889	181.055	211.994	190.404
LWHPB	170.168	185.638	207.984	236.632	295.646	152.407	140.948
NWHPB	170.168	115.737	169.778	208.739	219.625	229.939	198.999
N	6	6	6	6	6	6	6
AVG	159.01843	164.62987	189.38873	244.48597	195.43944	164.5648	158.73549
SEM	31.138326	18.129786	6.183971	28.084324	36.392395	20.576402	13.896161

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA							
EWHPA	231.084	196.707	184.492	221.917	222.881	204.546	198.999
GWHPA	202.254	205.119	177.799	240.252	79.068	159.282	150.688
HWHPA	181.628	202.827	128.525	162.147	138.083	185.821	181.237
KWHPA	70.474	122.613	156.600	212.750	218.297	218.297	161.184
LWHPA	148.396	147.823	193.269	231.475	9.626	114.592	138.083
NWHPA	297.548	112.873	166.158	193.660	224.599	224.209	220.771
N	6	6	6	6	6	6	6
AVG	188.56395	164.66029	167.80732	210.36676	148.75894	184.45775	175.16028
SEM	31.347358	17.179463	9.483262	11.664802	36.701578	16.976193	12.720782

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	187.930	170.741	201.108	190.977	201.108	192.514	197.280
BWPSB	216.761	302.131	129.671	201.108	147.433	220.771	171.497
DWPSB	203.973	160.428	209.312	176.654	174.362	242.544	179.518
FWPSB	192.514	237.205	206.447	196.134	220.771	190.404	183.346
IWPSB	170.168	130.244	123.941	189.259	184.102	201.291	170.351
N	5	5	5	5	5	5	5
AVG	194.26919	200.14986	174.09599	190.82636	185.55515	209.50478	180.39853
SEM	7.8234728	30.905309	19.372026	4.1063258	12.374977	9.847552	4.8715582

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	170.168	130.634	175.508	181.055	140.948	186.394	188.113
BWPSA	130.634	247.518	162.330	190.404	143.239	159.465	161.184
DWPSA	179.336	357.095	290.099	201.108	188.503	214.859	216.188
FWPSA	157.173	178.763	215.615	277.312	322.815	181.810	173.789
IWPSA	206.265	36.383	175.325	174.752	176.471	182.383	197.097
N	5	5	5	5	5	5	5
AVG	168.71527	190.07858	203.7752	204.92621	194.39524	184.98219	187.27402
SEM	12.466464	54.073018	23.364721	18.635214	33.407487	8.839068	9.4756515

Table 23: Calf Circumference Amplitudes (% change)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	0.428	0.283	0.149	0.105	0.043	0.038	0.032
D_HPB	1.050	0.802	0.741	1.010	1.010	0.716	0.760
G_HPB	0.362	0.236	0.120	0.058	0.039	0.035	0.038
I_HPB	0.654	0.549	0.355	0.250	0.228	0.219	0.194
J_HPB	1.070	0.940	0.751	0.675	0.678	0.520	0.539
K_HPB	0.389	0.315	0.197	0.131	0.136	0.114	0.125
L_HPB	0.425	0.343	0.092	0.101	0.069	0.081	0.097
N	7	7	7	7	7	7	7
AVG	0.6254286	0.4954286	0.3436	0.3329143	0.3147	0.2460571	0.2551571
SEM	0.117834	0.1049623	0.1087364	0.1383748	0.1435227	0.1011096	0.1066411

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	0.498	0.352	0.307	0.172	0.157	0.163	0.161
D_HPA	0.698	0.517	0.335	0.192	0.273	0.166	0.240
G_HPA	0.215	0.148	0.130	0.139	0.136	0.107	0.133
I_HPA	0.466	0.428	0.274	0.146	0.137	0.118	0.104
J_HPA	0.710	0.535	0.373	0.306	0.327	0.257	0.299
K_HPA	0.267	0.211	0.160	0.068	0.064	0.057	0.054
L_HPA	.	.	.	.	.	.	.
N	6	6	6	6	6	6	6
AVG	0.4756667	0.3651667	0.2631667	0.1704833	0.18235	0.1447333	0.1650833
SEM	0.0849363	0.0650505	0.0398492	0.0321165	0.0399882	0.0277821	0.0368665

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	0.774	0.321	0.185	0.057	0.039	0.023	0.025
C_PSB	0.460	0.325	0.226	0.108	0.086	0.067	0.055
E_PSB	0.323	0.234	0.115	0.045	0.046	0.056	0.054
F_PSB	0.406	0.265	0.140	0.087	0.066	0.056	0.056
M_PSB	0.626	0.465	0.307	.	0.265	0.242	0.236
N_PSB	0.592	0.428	0.238	0.121	0.100	0.069	0.060
O_PSB	0.386	0.272	0.224	0.096	0.047	0.040	0.044
N	7	7	7	6	7	7	7
AVG	0.5095714	0.33	0.205	0.0857	0.0926	0.0788857	0.0757429
SEM	0.0604617	0.032638	0.0244073	0.0119845	0.0299559	0.0278433	0.0270766

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	0.422	0.180	0.212	0.078	0.084	0.064	0.057
C_PSA	0.462	0.421	0.199	0.090	0.072	0.043	0.044
E_PSA	0.520	0.343	0.172	0.077	0.095	0.029	0.031
F_PSA	0.472	0.509	0.425	0.228	0.311	0.275	0.237
M_PSA	0.548	0.314	0.193	0.105	0.078	0.053	0.041
N_PSA	0.409	0.383	0.247	0.130	0.115	0.091	0.072
O_PSA	0.494	0.382	0.282	0.155	0.120	0.082	0.088
N	7	7	7	7	7	7	7
AVG	0.4752857	0.3617143	0.2471429	0.1232814	0.1249429	0.0908238	0.0815286
SEM	0.0189344	0.0383342	0.032725	0.0204705	0.0317515	0.0317484	0.026951

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	0.188	0.204	0.323	0.331	0.334	0.308	0.307
GWHPB	0.501	0.476	0.412	0.258	0.235	0.221	0.202
HWHPB	0.504	0.419	0.321	0.160	0.107	0.137	0.131
KWHPB	0.294	0.277	0.122	0.040	0.032	0.013	0.023
LWHPB	0.346	0.239	0.153	0.068	0.065	0.048	0.072
NWHPB	0.182	0.089	0.131	0.116	0.108	0.088	0.106
N	6	6	6	6	6	6	6
AVG	0.3358333	0.2839333	0.2436667	0.162179	0.1467167	0.1359167	0.1402
SEM	0.0585755	0.0582363	0.0504405	0.0461021	0.0468725	0.0454324	0.0413263

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	0.381	0.356	0.260	0.098	0.108	0.088	0.088
GWHPA	0.301	0.257	0.128	0.028	0.046	0.055	0.085
HWHPA	0.316	0.400	0.206	0.098	0.130	0.177	0.143
KWHPA	0.415	0.427	0.290	0.142	0.152	0.134	0.130
LWHPA	0.403	0.365	0.245	0.165	0.168	0.142	0.139
NWHPA	0.541	0.395	0.351	0.239	0.264	0.215	0.242
N	6	6	6	6	6	6	6
AVG	0.3928333	0.3666667	0.2466667	0.1281167	0.1446667	0.13515	0.1377333
SEM	0.0351306	0.0242881	0.0309189	0.0293295	0.0295146	0.0237011	0.0232927

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	0.398	0.377	0.215	0.219	0.214	0.219	0.251
BWPSB	0.302	0.325	0.121	0.114	0.097	0.083	0.060
DWPSB	0.260	0.258	0.194	0.097	0.052	0.111	0.128
FWPSB	0.666	0.598	0.370	0.176	0.140	0.117	0.122
IWPSB	0.433	0.362	0.183	0.277	0.150	0.150	0.333
N	5	5	5	5	5	5	5
AVG	0.4118	0.384	0.2166	0.17664	0.1306	0.13598	0.1787
SEM	0.0708367	0.0573088	0.0414205	0.0332426	0.0271194	0.0233352	0.0495125

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	0.294	0.327	0.205	0.165	0.180	0.230	0.209
BWPSA	0.435	0.345	0.218	0.187	0.193	0.191	0.195
DWPSA	0.185	0.172	0.204	0.232	0.303	0.245	0.243
FWPSA	0.757	0.671	0.243	0.111	0.089	0.074	0.081
IWPSA	0.515	0.463	0.301	0.215	0.201	0.197	0.176
N	5	5	5	5	5	5	5
AVG	0.4372	0.3956	0.2342	0.182	0.1931	0.18748	0.18072
SEM	0.098092	0.0829612	0.0181202	0.0211471	0.0340978	0.0300055	0.027321

Table 24: Calf Circumference Phase Lags (degrees)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	36.898	66.463	81.543	81.933	111.154	105.997	103.705
D_HPB	11.803	14.668	11.287	10.943	8.251	5.959	8.251
G_HPB	61.306	47.326	82.688	143.239	133.682	139.984	180.664
I_HPB	18.220	28.190	35.581	27.273	23.778	21.658	21.601
J_HPB	15.871	18.392	14.610	13.121	13.980	12.720	16.387
K_HPB	16.329	17.991	31.054	12.376	5.197	0.000	0.000
L_HPB	8.594	37.987	101.596	183.919	176.471	195.952	11.918
N	7	7	7	7	7	7	7
AVG	24.146078	33.002369	51.194238	67.543538	67.501674	68.895599	48.932112
SEM	7.0751517	7.1510506	13.830251	26.864248	26.872071	29.547432	25.62509

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	26.986	31.570	43.727	33.690	30.549	23.491	19.663
D_HPA	20.168	38.044	37.128	33.987	24.122	30.309	16.215
G_HPA	67.036	56.436	123.186	170.741	177.044	190.404	193.660
I_HPA	26.471	30.539	42.857	42.571	42.170	39.717	39.477
J_HPA	33.747	20.798	19.137	11.230	7.792	7.506	3.959
K_HPA	30.882	32.601	44.462	39.992	31.742	27.960	23.377
L_HPA	.	.	.	.	.	.	.
N	6	6	6	6	6	6	6
AVG	34.215129	34.998172	51.749408	55.368591	52.236422	53.231319	49.391687
SEM	6.8266411	4.8576193	14.806634	23.513439	25.38658	27.771964	29.232957

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	37.185	36.383	39.717	104.851	85.944	108.472	122.040
C_PSB	34.779	26.643	67.036	93.002	92.246	87.090	122.040
E_PSB	13.923	22.173	43.316	0.481	5.099	0.000	0.000
F_PSB	24.064	37.758	51.222	51.509	34.263	38.617	28.648
M_PSB	14.954	24.408	23.950	.	15.126	15.069	15.584
N_PSB	28.476	44.633	61.306	72.948	63.025	61.879	54.660
O_PSB	18.507	30.309	45.837	84.798	129.488	127.952	135.791
N	7	7	7	6	7	7	7
AVG	24.555334	31.758232	47.483348	67.931506	60.741711	62.725542	68.39479
SEM	3.5235708	3.0756965	5.3931354	15.406117	17.069181	18.079445	21.565571

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	48.931	42.342	95.866	127.770	132.536	141.703	146.860
C_PSA	25.439	59.588	85.371	100.841	91.100	114.692	131.207
E_PSA	16.673	56.494	71.802	101.986	100.841	87.845	105.034
F_PSA	0.980	21.715	31.169	30.252	24.293	28.877	29.393
M_PSA	23.205	41.482	60.734	80.787	83.652	114.201	88.418
N_PSA	30.711	36.612	56.905	69.119	66.073	64.354	65.500
O_PSA	11.631	33.575	50.030	67.036	73.912	79.068	71.620
N	7	7	7	7	7	7	7
AVG	22.509875	41.686772	64.553857	82.541573	81.772296	90.105809	91.147283
SEM	5.7535354	4.9535231	8.2591314	11.868702	12.576589	14.130706	15.245385

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	88.808	83.079	130.817	163.475	168.450	169.596	169.596
GWHPB	29.507	20.684	39.076	27.621	26.012	29.622	31.054
HWHPB	24.580	30.940	38.732	31.856	48.587	21.371	14.897
KWHPB	19.137	31.799	66.646	71.047	65.317	36.898	70.474
LWHPB	30.882	47.326	79.068	97.976	98.549	112.300	119.175
NWHPB	54.316	63.025	131.963	169.778	179.336	175.508	174.362
N	6	6	6	6	6	6	6
AVG	41.205214	46.142201	81.05019	93.625617	97.708402	90.882425	96.592904
SEM	10.715704	9.5493996	17.15899	25.415829	25.993913	29.048682	28.011351

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	30.195	41.941	62.452	117.639	117.456	129.488	138.656
GWHPA	23.892	31.570	53.468	29.851	13.579	2.332	5.901
HWHPA	7.792	16.272	33.346	1.261	0.000	0.000	0.000
KWHPA	20.397	35.008	43.727	50.603	43.602	40.164	29.393
LWHPA	21.371	18.621	31.455	20.684	16.387	13.063	11.860
NWHPA	27.215	23.491	24.523	17.475	11.975	10.772	9.282
N	6	6	6	6	6	6	6
AVG	21.810593	27.817101	41.495234	39.585374	33.833157	32.636631	32.515355
SEM	3.1756774	4.0899382	5.8957579	16.954263	17.725075	20.233352	21.608267

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	3.741	3.140	8.594	0.000	0.000	0.000	0.000
BWPSB	21.658	54.145	87.845	108.289	114.019	123.759	186.394
DWPSB	19.309	17.131	26.070	0.000	0.000	0.000	0.000
FWPSB	15.584	39.190	63.025	58.051	64.171	62.452	49.217
IWPSB	6.417	0.000	21.601	0.934	3.128	0.000	0.000
N	5	5	5	5	5	5	5
AVG	13.341895	22.721214	41.426972	33.454838	36.263644	37.242256	47.122173
SEM	3.5348801	10.463234	14.710619	21.795872	22.970329	24.780673	36.098802

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	6.474	10.084	11.001	0.000	0.000	0.000	0.000
BWPSA	9.053	29.507	18.678	3.449	4.887	4.950	1.375
DWPSA	26.700	100.268	138.656	160.428	167.877	173.606	182.383
FWPSA	27.273	39.305	83.079	100.841	99.877	106.180	125.660
IWPSA	25.325	32.487	44.060	39.133	36.326	34.435	31.685
N	5	5	5	5	5	5	5
AVG	18.964903	42.330121	59.094866	60.770195	61.79333	63.834206	68.220603
SEM	4.6019604	15.275848	23.534799	30.809275	31.944767	33.353766	36.598935

Table 25: Heart Rate Amplitudes (beats per minute)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	6.130	7.510	3.600	2.810	2.100	0.725	1.330
D_HPB	5.070	0.538	1.530	2.280	3.770	1.630	2.420
G_HPB	3.780	0.920	0.627	1.970	0.174	1.180	0.810
I_HPB	6.850	7.170	4.990	5.650	6.920	9.130	10.600
J_HPB	0.533	0.473	1.090	0.981	0.542	0.195	0.166
K_HPB	3.620	1.690	1.730	1.960	3.440	2.230	2.140
L_HPB	2.970	6.970	1.400	1.560	0.249	0.990	0.963
N	7	7	7	7	7	7	7
AVG	4.1361429	3.6101429	2.1381429	2.4587143	2.4564286	2.2971429	2.6327143
SEM	0.8010164	1.2852057	0.5922826	0.5735962	0.9321078	1.1648093	1.3597762

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	0.380	3.380	3.290	4.110	3.340	5.870	2.880
D_HPA	3.530	2.670	2.580	2.060	2.510	0.538	1.310
G_HPA	3.350	5.330	5.500	2.820	1.210	0.852	1.330
I_HPA	6.200	2.460	3.420	2.200	3.080	7.590	5.860
J_HPA	3.230	1.160	0.476	1.340	1.240	1.270	0.719
K_HPA	3.480	2.400	2.120	3.800	6.500	8.660	5.400
L_HPA	.	.	.	.	.	.	.
N	6	6	6	6	6	6	6
AVG	3.3616667	2.9	2.8976667	2.7216667	2.98	4.13	2.9165
SEM	0.7529118	0.5674328	0.6774719	0.4366113	0.7939647	1.498304	0.9084809

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	5.190	1.710	1.350	1.840	2.420	2.440	1.330
C_PSB	2.850	2.630	4.360	1.290	1.970	1.340	0.999
E_PSB	0.823	4.040	2.960	2.710	2.510	1.170	1.600
F_PSB	2.800	1.560	1.260	0.437	1.800	0.527	0.511
M_PSB	3.130	2.580	0.938	.	1.500	2.510	2.570
N_PSB	6.460	6.090	2.240	0.888	1.730	0.556	2.370
O_PSB	5.160	7.490	12.200	11.800	5.400	6.890	4.000
N	7	7	7	6	7	7	7
AVG	3.7732857	3.7285714	3.6154286	3.1608333	2.4757143	2.2047143	1.9114286
SEM	0.7248355	0.8608562	1.4993608	1.7575372	0.5065328	0.8373969	0.4427971

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	1.470	0.958	0.409	0.380	0.486	0.273	0.298
C_PSA	4.120	5.540	8.470	6.930	5.160	3.151	2.430
E_PSA	1.290	2.500	0.787	2.040	0.563	0.807	1.640
F_PSA	5.690	3.730	1.280	2.030	3.000	0.361	1.480
M_PSA	2.570	1.400	1.140	1.250	3.030	2.610	2.400
N_PSA	4.240	4.840	2.490	3.212	0.829	1.250	1.930
O_PSA	3.340	5.950	5.020	3.580	2.230	1.720	0.312
N	7	7	7	7	7	7	7
AVG	3.2457143	3.5597143	2.7994286	2.7745761	2.1854286	1.4531616	1.4985714
SEM	0.6010105	0.7537115	1.1127877	0.8056341	0.647102	0.4179592	0.335798

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	3.640	2.340	4.610	4.950	3.790	1.910	0.912
GWHPB	9.290	4.230	5.080	1.398	1.330	4.120	5.120
HWHPB	11.200	4.380	4.690	1.230	3.420	2.250	3.490
KWHPB	5.880	2.090	3.800	2.820	1.270	1.370	0.826
LWHPB	7.040	6.990	3.750	3.400	4.910	3.820	6.070
NWHPB	2.120	0.988	1.120	5.580	4.660	3.220	0.797
N	6	6	6	6	6	6	6
AVG	6.5283333	3.503	3.8416667	3.2297386	3.23	2.7816667	2.8691667
SEM	1.3893558	0.8780886	0.5848385	0.731039	0.6498359	0.4508024	0.9660215

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	3.280	0.953	1.070	2.090	3.330	2.080	4.420
GWHPA	5.910	1.420	3.370	3.160	5.420	3.010	2.120
HWHPA	2.760	0.817	0.917	0.983	4.350	2.060	1.560
KWHPA	5.760	8.610	6.270	5.450	3.910	3.410	1.370
LWHPA	5.010	4.420	2.790	2.380	9.060	5.850	7.530
NWHPA	4.150	1.770	1.780	5.910	4.620	2.610	2.380
N	6	6	6	6	6	6	6
AVG	4.4783333	2.9983333	2.6995	3.3288333	5.115	3.17	3.23
SEM	0.531397	1.2443671	0.8141312	0.7985028	0.8391375	0.5773329	0.9679738

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	2.220	1.070	2.500	1.210	1.110	1.160	0.588
BWPSB	14.400	6.750	2.190	1.800	1.520	3.830	6.160
DWPSB	6.420	0.890	3.970	2.650	3.920	1.340	1.490
FWPSB	1.900	0.493	0.634	0.316	0.968	0.449	0.467
IWPSB	12.700	4.240	2.030	0.836	1.970	1.910	2.170
N	5	5	5	5	5	5	5
AVG	7.528	2.6886	2.2648	1.3624	1.8976	1.7378	2.175
SEM	2.5985658	1.2160859	0.5330695	0.402783	0.5349016	0.5727153	1.0436788

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	6.570	1.390	2.590	1.400	2.390	0.522	0.853
BWPSA	18.000	15.000	3.040	3.250	2.740	3.960	4.740
DWPSA	2.030	3.960	2.500	1.580	3.450	1.230	1.420
FWPSA	7.310	2.830	3.890	2.040	1.640	0.272	0.548
IWPSA	9.810	6.180	1.950	0.893	2.040	2.610	1.940
N	5	5	5	5	5	5	5
AVG	8.744	5.872	2.794	1.8326	2.452	1.7188	1.9002
SEM	2.633157	2.4126032	0.3242006	0.3991137	0.3091828	0.6921597	0.7490565

Table 26: Heart Rate Phase Lags (degrees)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	53.285	35.523	27.112	77.349	79.068	71.620	60.734
D_HPB	288.953	356.923	256.685	227.464	271.009	329.519	318.690
G_HPB	120.894	87.090	15.871	164.048	268.900	288.380	285.515
I_HPB	35.180	54.889	138.656	221.735	270.046	312.330	337.597
J_HPB	55.348	46.467	343.270	107.326	110.008	83.652	345.963
K_HPB	16.100	260.305	276.348	296.219	5.655	59.770	21.543
L_HPB	24.465	18.965	94.538	117.456	165.585	59.015	145.531
N	7	7	7	7	7	7	7
AVG	84.889306	122.88038	164.63988	173.0854	167.18148	172.04074	216.51045
SEM	36.405138	49.721636	48.671724	29.741643	40.483356	49.109159	52.084844

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	206.447	294.110	347.166	45.722	54.613	94.538	127.952
D_HPA	49.274	154.699	135.791	259.159	269.473	338.170	334.446
G_HPA	61.306	39.992	70.474	195.952	11.918	11.345	6.990
I_HPA	67.036	28.591	95.294	270.619	251.138	47.738	318.690
J_HPA	80.214	72.375	16.387	254.003	309.923	313.533	329.060
K_HPA	63.598	181.628	342.056	283.041	305.626	320.867	358.419
L_HPA	.	.	.	.	.	.	.
N	6	6	6	6	6	6	6
AVG	87.979439	128.56572	167.86107	218.08259	200.44858	187.6985	245.92615
SEM	24.039919	41.593661	58.085371	36.585588	53.91125	62.069446	58.794694

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	99.695	52.999	278.640	12.490	73.339	92.819	99.695
C_PSB	114.592	332.383	32.315	46.019	83.079	333.759	37.070
E_PSB	108.289	34.377	72.193	232.048	304.939	334.102	4.240
F_PSB	155.272	243.507	98.549	249.992	161.001	231.475	306.658
M_PSB	31.971	144.568	127.197	.	300.230	278.640	344.817
N_PSB	352.953	47.212	68.755	134.828	268.327	315.023	11.631
O_PSB	51.795	329.977	37.300	121.467	189.076	242.544	284.760
N	7	7	7	6	7	7	7
AVG	130.65226	169.28902	102.13534	132.80738	197.14144	261.19449	155.55289
SEM	40.147461	50.039824	31.953919	39.039289	36.846987	32.132271	56.928371

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	83.079	190.795	310.210	49.790	75.630	81.543	55.462
C_PSA	60.734	344.186	35.008	72.193	159.282	153.131	324.867
E_PSA	325.623	53.228	335.019	316.846	185.638	358.785	18.793
F_PSA	143.239	150.115	290.672	121.077	168.450	221.344	306.532
M_PSA	331.352	25.038	12.662	286.088	338.457	313.476	342.066
N_PSA	31.169	33.575	103.315	200.666	311.642	340.118	19.079
O_PSA	331.868	7.219	70.656	173.033	161.001	171.497	193.842
N	7	7	7	7	7	7	7
AVG	186.72331	114.87955	165.3632	174.24184	200.01441	234.27062	180.09185
SEM	52.094468	46.203434	53.138519	38.506044	35.011093	39.939907	55.815753

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	47.498	40.164	83.652	254.003	291.636	326.195	337.540
GWHPB	56.608	60.161	51.853	235.646	284.370	355.422	1.083
HWHPB	54.775	103.132	98.731	192.514	199.962	294.110	328.258
KWHPB	7.735	14.954	81.543	172.070	194.233	203.400	258.586
LWHPB	38.216	47.957	92.819	181.628	284.187	315.424	329.060
NWHPB	165.012	46.983	20.236	154.308	175.325	188.686	264.316
N	6	6	6	6	6	6	6
AVG	61.640709	52.225103	71.472245	198.36135	238.28537	280.53949	253.14065
SEM	21.91849	11.881094	12.190945	15.739806	21.947098	27.976525	52.350532

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	101.414	161.184	181.055	259.159	265.852	280.932	301.558
GWHPA	51.795	14.381	98.158	272.910	319.492	351.749	4.016
HWHPA	84.225	182.774	248.273	301.558	318.565	290.672	358.957
KWHPA	30.997	39.419	76.386	163.475	167.877	172.460	358.029
LWHPA	93.965	79.641	115.920	205.692	282.651	318.690	5.317
NWHPA	84.798	108.289	67.036	128.343	175.898	198.999	211.604
N	6	6	6	6	6	6	6
AVG	74.532259	97.614679	131.13802	221.85634	255.0557	268.91704	206.58033
SEM	11.123317	27.107514	28.658004	27.546862	27.646321	28.371709	67.513089

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	22.460	140.375	122.040	230.512	234.913	237.960	326.425
BWPSB	24.694	65.890	35.133	118.602	271.192	290.672	295.256
DWPSB	97.976	309.981	328.258	15.642	76.776	191.368	65.890
FWPSB	37.300	51.394	19.194	159.465	173.789	247.127	334.034
IWPSB	55.061	46.019	94.721	0.206	288.953	210.458	318.575
N	5	5	5	5	5	5	5
AVG	47.498201	122.73181	119.86914	104.8852	209.12451	235.51707	268.03603
SEM	13.885464	49.788702	55.398028	43.515088	38.506251	16.970488	50.952474

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	46.868	38.617	79.824	236.632	264.316	304.366	323.617
BWPSA	43.946	68.182	73.521	262.597	319.836	307.345	326.195
DWPSA	268.327	6.016	2.378	105.997	56.666	75.630	109.044
FWPSA	37.586	50.019	88.235	172.460	233.376	268.900	329.748
IWPSA	59.015	18.678	53.915	165.012	356.597	49.962	266.998
N	5	5	5	5	5	5	5
AVG	91.148249	36.302606	59.57467	188.53961	246.15804	201.24061	271.12066
SEM	44.431133	11.040119	15.377711	27.769327	51.973826	57.067459	42.137837

Table 27: Total Peripheral Resistance Amplitudes (mmHg/L/min)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	4.150	1.100	2.520	1.660	1.370	1.640	1.410
D_HPB	1.000	0.938	0.472	0.844	1.050	0.920	1.480
G_HPB	0.774	0.840	0.471	0.607	0.855	1.200	0.890
I_HPB	0.420	1.140	1.060	0.872	0.946	1.500	1.420
J_HPB	2.310	0.151	1.480	1.770	0.998	0.583	1.020
K_HPB	1.210	1.450	0.835	0.886	2.970	1.620	2.370
L_HPB	1.290	1.670	0.968	0.175	0.035	0.054	0.201
N	7	7	7	7	7	7	7
AVG	1.5934286	1.0412857	1.1151429	0.9734286	1.1748143	1.0738571	1.2558571
SEM	0.4803068	0.1838292	0.2689693	0.2133825	0.3367254	0.2247232	0.250925

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	1.610	0.283	0.288	0.247	0.306	0.699	0.639
D_HPA	0.833	0.545	1.590	0.746	0.662	0.747	1.030
G_HPA	1.340	1.560	1.010	0.606	0.353	0.512	0.344
I_HPA	0.314	0.839	0.994	0.437	0.543	0.583	0.984
J_HPA	.	.	..	.	.	.	.
K_HPA	1.570	0.543	0.935	1.000	1.420	1.910	1.160
L_HPA	.	.	.	.	.	.	.
N	5	5	5	5	5	5	5
AVG	1.1334	0.754	0.9634	0.6072	0.6568	0.8902	0.8314
SEM	0.247195	0.2198754	0.2064833	0.1288935	0.2013463	0.2583082	0.1492118

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	2.300	0.785	0.792	0.413	0.555	0.627	1.080
C_PSB	2.100	1.560	2.430	0.669	0.921	1.260	1.160
E_PSB	0.516	2.200	1.590	2.360	2.430	2.990	2.650
F_PSB	1.270	2.260	0.873	0.767	0.771	0.503	0.697
M_PSB	.	1.090	1.810	.	.	0.617	0.993
N_PSB	2.290	2.740	1.350	0.551	1.440	0.585	1.140
O_PSB	1.550	1.660	1.320	1.440	0.647	1.210	0.900
N	6	7	7	6	6	7	7
AVG	1.671	1.7564286	1.4521429	1.0333333	1.1273333	1.1131429	1.2314286
SEM	0.287072	0.260651	0.2128246	0.3025752	0.2899732	0.3340674	0.2440259

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	1.610	1.020	0.753	0.646	1.160	1.110	0.961
C_PSA	0.430	1.150	2.360	1.670	0.295	0.515	1.200
E_PSA	1.250	2.480	1.250	1.920	1.830	3.270	2.220
F_PSA	2.230	2.390	1.170	0.708	1.880	1.780	2.110
M_PSA	1.870	1.200	1.350	1.340	2.460	1.570	1.860
N_PSA	2.450	1.700	1.020	0.481	0.930	0.388	0.468
O_PSA	2.560	2.240	1.420	0.240	0.196	0.504	0.778
N	7	7	7	7	7	7	7
AVG	1.7714286	1.74	1.3318571	1.0007602	1.2501429	1.3053296	1.371
SEM	0.2845082	0.2380376	0.190888	0.2424136	0.3211156	0.3873353	0.2614266

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	1.550	1.500	0.156	4.210	1.550	1.870	1.910
GWHPB	4.650	3.250	2.420	0.889	1.580	1.530	1.020
HWHPB	0.762	0.348	1.490	0.918	0.574	1.580	1.170
KWHPB	3.930	3.370	2.420	0.430	2.070	1.650	1.870
LWHPB	0.724	0.822	0.790	0.631	0.774	1.130	1.070
NWHPB	1.420	1.820	0.534	1.870	2.690	2.270	2.370
N	6	6	6	6	6	6	6
AVG	2.1726667	1.8516667	1.3016667	1.4913971	1.5396667	1.6716667	1.5683333
SEM	0.6896433	0.5068389	0.3958314	0.5800056	0.3227492	0.1548853	0.227895

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	1.550	1.440	1.890	1.210	1.070	1.380	1.900
GWHPA	2.690	2.490	0.905	1.680	1.570	1.120	1.390
HWHPA	0.313	0.234	1.210	1.790	1.700	1.990	1.920
KWHPA	4.240	3.420	2.300	1.100	0.913	1.010	1.040
LWHPA	0.546	0.960	1.790	0.951	1.960	2.900	2.500
NWHPA	1.690	1.380	0.331	0.767	1.620	1.360	1.770
N	6	6	6	6	6	6	6
AVG	1.8381667	1.654	1.4043333	1.2496667	1.4721667	1.6266667	1.7533333
SEM	0.5942851	0.4631976	0.2958588	0.1656592	0.162862	0.2899617	0.2039553

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	0.595	1.290	0.856	0.709	0.738	0.695	0.643
BWPSB	1.970	2.070	1.580	2.700	2.180	1.460	2.440
DWPSB	.	.	.	.	.	.	.
FWPSB	0.998	0.823	2.380	2.470	3.350	2.450	2.690
IWPSB	1.350	1.200	1.470	0.452	1.100	0.619	0.293
N	4	4	4	4	4	4	4
AVG	1.22825	1.34575	1.5715	1.58275	1.842	1.306	1.5165
SEM	0.2914099	0.26175	0.3130478	0.5829161	0.5886204	0.4260029	0.6116854

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	1.100	1.390	0.287	0.167	0.686	0.713	0.634
BWPSA	2.130	2.880	0.914	3.260	2.530	1.960	2.040
DWPSA	.	.	.	.	.	.	.
FWPSA	3.320	3.800	3.240	1.830	0.840	1.250	0.103
IWPSA	0.946	1.060	1.270	1.560	2.600	2.410	1.660
N	4	4	4	4	4	4	4
AVG	1.874	2.2825	1.42775	1.70425	1.664	1.58325	1.10925
SEM	0.5489924	0.6423184	0.6373372	0.6337795	0.5213374	0.3757045	0.4479604

Table 28: Total Peripheral Resistance Phase Lags (degrees)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	49.962	87.090	98.158	543.000	505.000	539.000	577.000
D_HPB	213.896	237.960	271.582	381.000	413.000	495.000	502.000
G_HPB	55.348	77.349	176.081	405.000	435.000	488.000	509.000
I_HPB	33.232	151.834	218.297	385.000	462.000	524.000	572.000
J_HPB	194.233	154.126	170.351	311.757	368.000	438.000	466.000
K_HPB	17.074	58.442	153.162	507.000	554.000	593.000	617.000
L_HPB	68.182	135.218	219.052	369.000	343.728	399.000	567.000
N	7	7	7	7	7	7	7
AVG	90.27511	128.85972	186.66905	414.53671	440.104	496.57143	544.28571
SEM	30.093021	23.128131	21.041041	30.774767	27.992866	24.337759	20.002041

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	67.036	17.246	112.482	270.046	188.686	360.000	446.000
D_HPA	198.243	0.142	165.012	424.000	416.000	482.000	499.000
G_HPA	22.575	81.360	156.990	306.000	458.000	450.000	527.000
I_HPA	1.169	90.527	195.561	375.000	380.000	614.000	531.000
J_HPA	.	.	.	.	.	.	.
K_HPA	8.136	0.000	118.029	424.000	485.000	510.000	533.000
L_HPA	.	.	.	.	.	.	.
N	5	5	5	5	5	5	5
AVG	59.431766	37.854977	149.61499	359.80913	385.53712	483.2	507.2
SEM	36.545023	19.933762	15.458014	31.164569	52.370265	41.296973	16.487571

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	0.000	293.537	99.877	153.553	372.000	429.000	485.000
C_PSB	0.000	69.328	147.823	553.000	576.000	570.000	596.000
E_PSB	115.737	144.958	212.750	365.000	397.000	436.000	489.000
F_PSB	0.000	0.000	178.763	400.000	431.000	498.000	523.000
M_PSB	.	241.398	236.059	.	.	492.000	545.000
N_PSB	12.376	65.317	123.759	498.000	462.000	493.000	521.000
O_PSB	12.777	92.246	113.628	260.696	353.182	393.000	425.000
N	6	7	7	6	6	7	7
AVG	23.48172	129.54061	158.95123	371.70808	431.86363	473	512
SEM	18.621877	39.510808	19.602358	60.436563	33.002119	22.092878	20.221394

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	22.173	64.171	201.864	364.000	438.000	485.000	523.000
C_PSA	246.945	75.630	165.194	581.000	617.000	626.000	577.000
E_PSA	183.346	195.952	270.619	365.000	404.000	468.000	507.000
F_PSA	0.000	36.497	123.368	308.778	460.000	510.000	511.000
M_PSA	93.965	259.550	238.923	400.000	447.000	499.000	546.000
N_PSA	16.100	52.884	117.066	437.000	508.000	489.000	548.000
O_PSA	25.153	52.254	107.326	271.765	326.482	408.000	442.000
N	7	7	7	7	7	7	7
AVG	83.954686	105.2769	174.90856	389.64887	457.21171	497.85714	522
SEM	36.342264	32.688181	24.225559	38.005906	33.986917	24.77463	16.201117

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	17.246	39.076	174.935	431.000	500.000	524.000	501.000
GWHPB	36.727	35.351	112.873	399.000	447.000	480.000	527.000
HWHPB	145.531	350.317	212.177	352.036	388.000	450.000	499.000
KWHPB	34.091	50.077	133.682	554.000	540.000	581.000	601.000
LWHPB	119.175	183.919	236.632	429.000	510.000	561.000	587.000
NWHPB	6.303	60.734	72.948	413.000	457.000	492.000	523.000
N	6	6	6	6	6	6	6
AVG	59.845441	119.91229	157.2076	429.67265	473.66667	514.66667	539.66667
SEM	23.623019	51.396334	25.339525	27.511064	22.167043	20.437982	17.878603

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	260.878	182.383	211.994	401.000	430.000	498.000	551.000
GWHPA	40.623	72.193	191.550	413.000	474.000	513.000	503.000
HWHPA	215.432	229.756	208.166	367.000	425.000	467.000	491.000
KWHPA	8.136	0.000	118.029	424.000	485.000	511.000	533.000
LWHPA	42.972	122.613	191.550	579.000	552.000	603.000	646.000
NWHPA	9.511	63.025	143.812	418.000	471.000	494.000	516.000
N	6	6	6	6	6	6	6
AVG	96.258679	111.66169	177.51718	433.66667	472.83333	514.33333	540
SEM	45.653598	34.379916	15.488406	30.221038	18.746407	18.969566	22.914333

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	42.399	95.684	170.168	506.000	514.000	567.000	597.000
BWPSB	180.482	260.878	295.256	385.000	445.000	471.000	515.000
DWPSB	.	.	.	.	.	.	.
FWPSB	0.000	83.652	196.707	340.749	404.000	454.000	502.000
IWPSB	168.450	139.411	196.707	316.627	558.000	587.000	678.000
N	4	4	4	4	4	4	4
AVG	97.832543	144.90634	214.70957	387.09393	480.25	519.75	573
SEM	45.149519	40.470823	27.56777	42.087707	34.448936	33.48476	40.830952

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	39.133	46.009	165.767	514.000	518.000	554.000	573.000
BWPSA	116.310	254.393	328.487	435.000	459.000	514.000	554.000
DWPSA	.	.	.	.	.	.	.
FWPSA	56.608	79.641	175.508	297.365	340.004	436.000	516.000
IWPSA	2.527	68.182	160.428	534.000	561.000	592.000	601.000
N	4	4	4	4	4	4	4
AVG	53.644605	112.05622	207.5476	445.09127	469.50094	524	561
SEM	23.73361	47.956421	40.433908	53.67963	47.96181	33.376639	17.837227

Table 29: Stroke Volume Amplitudes (mL)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	20.500	16.200	19.100	10.200	8.510	9.630	7.440
D_HPB	6.690	0.842	0.908	6.360	10.600	7.090	10.900
G_HPB	12.600	10.700	1.410	7.600	9.990	9.080	4.900
I_HPB	23.800	29.600	24.800	18.800	19.100	22.500	13.500
J_HPB	1.720	1.820	1.170	7.330	4.420	3.260	3.750
K_HPB	11.200	6.520	1.230	1.560	7.920	5.390	9.650
L_HPB	31.000	31.000	12.200	4.930	4.880	3.470	0.860
N	7	7	7	7	7	7	7
AVG	15.358571	13.811714	8.6882857	8.1114286	9.3457143	8.6314286	7.2857143
SEM	3.868076	4.6936573	3.7984339	2.04468	1.8520952	2.4971941	1.6674529

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	16.500	10.000	9.390	6.430	6.360	6.700	9.870
D_HPA	2.950	1.150	5.420	4.090	4.450	3.730	4.410
G_HPA	22.900	20.000	13.300	6.040	4.800	6.590	2.980
I_HPA	20.200	17.900	18.600	17.000	19.600	6.510	12.800
J_HPA	.	.	.	.	.	.	.
K_HPA	15.400	1.830	6.070	8.890	9.320	18.000	10.200
L_HPA	.	.	.	.	.	.	.
N	5	5	5	5	5	5	5
AVG	15.59	10.176	10.556	8.49	8.906	8.306	8.052
SEM	3.4301749	3.9199906	2.4504869	2.2603783	2.8082941	2.4865933	1.8634897

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	11.200	3.950	1.790	4.270	6.830	5.140	8.300
C_PSB	6.900	6.110	8.630	2.090	2.290	2.580	2.490
E_PSB	3.960	7.950	2.160	13.400	17.800	16.200	15.000
F_PSB	0.707	4.450	2.790	1.240	2.460	1.710	0.947
M_PSB	5.550	5.400	7.540	.	4.850	3.800	5.470
N_PSB	36.600	29.900	15.900	4.910	10.600	4.620	9.500
O_PSB	18.100	10.800	28.800	9.420	2.740	10.500	10.500
N	7	7	7	6	7	7	7
AVG	11.859571	9.7942857	9.6585714	5.8883333	6.7957143	6.3642857	7.4581429
SEM	4.6359309	3.4649722	3.7039756	1.9018262	2.1541907	1.957559	1.8389991

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	11.100	3.120	4.880	7.920	10.500	8.030	5.210
C_PSA	6.280	7.280	10.600	6.530	4.680	4.575	1.720
E_PSA	3.400	11.700	11.200	25.200	20.300	26.000	20.700
F_PSA	3.790	5.000	4.000	3.980	6.430	6.190	7.460
M_PSA	8.850	6.500	7.370	12.000	22.100	13.600	8.510
N_PSA	33.000	28.100	16.000	3.251	7.160	4.940	1.870
O_PSA	32.700	34.300	26.500	3.020	4.910	10.900	16.200
N	7	7	7	7	7	7	7
AVG	14.16	13.714286	11.507143	8.8430586	10.868571	10.605051	8.81
SEM	4.932028	4.6710898	2.9410111	2.9782624	2.7709809	2.8478677	2.7136709

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB							
EWHPB	11.800	11.800	6.310	14.500	4.500	5.550	6.050
GWHPB	45.800	28.600	22.600	11.143	13.800	9.390	11.700
HWHPB	22.600	8.160	8.950	11.700	6.520	16.300	13.000
KWHPB	21.100	14.900	14.500	4.620	9.760	8.570	8.210
LWHPB	22.000	13.600	1.380	11.600	8.620	10.600	8.660
NWHPB	7.470	11.100	8.890	12.700	15.900	11.000	12.600
N	6	6	6	6	6	6	6
AVG	21.795	14.693333	10.438333	11.043896	9.85	10.235	10.036667
SEM	5.423771	2.9359912	2.9894943	1.3748139	1.7648173	1.4484262	1.1437385

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA							
EWHPA	2.950	7.070	7.980	9.920	9.470	7.910	6.650
GWHPA	28.900	20.400	5.780	19.000	12.900	9.420	9.360
HWHPA	2.270	3.910	16.300	26.700	29.000	15.900	19.800
KWHPA	19.700	19.300	13.900	6.130	5.780	5.570	2.770
LWHPA	10.100	11.700	12.200	8.530	12.700	19.600	14.200
NWHPA	18.100	11.500	5.540	8.620	12.200	8.820	12.000
N	6	6	6	6	6	6	6
AVG	13.67	12.313333	10.283333	13.15	13.675	11.203333	10.796667
SEM	4.2644343	2.6667954	1.8351997	3.2629414	3.2588114	2.1909186	2.4343167

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	13.200	10.200	7.290	2.770	3.180	3.620	3.890
BWPSB	14.700	2.650	9.870	14.900	16.500	12.200	12.500
DWPSB	.	.	.	.	.	.	.
FWPSB	11.600	5.710	5.300	10.100	13.100	7.850	6.250
IWPSB	17.800	9.510	9.650	5.520	2.110	5.060	4.120
N	4	4	4	4	4	4	4
AVG	14.325	7.0175	8.0275	8.3225	8.7225	7.1825	6.69
SEM	1.319959	1.7589172	1.0805275	2.6631322	3.5834861	1.8889432	2.008204

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	21.700	14.900	5.000	2.740	2.590	1.190	2.090
BWPSA	20.800	8.810	6.500	14.200	11.500	7.320	9.360
DWPSA	.	.	.	.	.	.	.
FWPSA	16.600	13.000	9.600	3.100	1.720	5.080	2.030
IWPSA	16.900	12.500	7.190	7.860	13.800	16.600	11.100
N	4	4	4	4	4	4	4
AVG	19	12.3025	7.0725	6.975	7.4025	7.5475	6.145
SEM	1.3133926	1.2737764	0.9585177	2.6760465	3.0709455	3.2724338	2.3851013

Table 30: Stroke Volume Phase Lags (degrees)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	222.881	239.106	259.159	344.645	307.105	354.597	393.403
D_HPB	112.873	88.808	113.446	172.460	190.222	263.170	299.266
G_HPB	267.181	238.350	165.194	243.117	240.825	291.245	311.069
I_HPB	212.567	262.597	382.000	174.179	208.739	296.402	345.504
J_HPB	363.000	300.230	345.103	149.152	193.660	234.340	247.127
K_HPB	199.962	216.005	430.000	256.112	369.000	415.000	445.000
L_HPB	229.366	249.419	393.000	233.194	177.044	189.076	475.000
N	7	7	7	7	7	7	7
AVG	229.68991	227.78801	298.27179	224.69404	240.94214	291.97567	359.48148
SEM	28.471707	25.176152	46.014859	25.248144	27.038145	28.375261	31.09012

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	208.739	165.585	221.344	201.681	272.910	225.745	274.056
D_HPA	252.284	280.932	327.341	185.248	198.243	263.170	284.760
G_HPA	206.265	236.814	279.030	225.172	258.977	250.565	284.187
I_HPA	212.567	262.597	382.000	174.179	208.739	296.402	345.504
J_HPA	.	.	.	.	.	.	.
K_HPA	206.838	134.645	242.361	206.265	234.913	275.202	293.537
L_HPA	.	.	.	.	.	.	.
N	5	5	5	5	5	5	5
AVG	217.3386	216.11459	290.41544	198.50908	234.75651	262.2169	296.4089
SEM	8.8056476	28.267396	29.121235	8.800428	14.234613	11.840746	12.655633

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	228.220	166.731	182.383	265.852	236.241	286.088	307.105
C_PSB	216.578	205.119	276.166	331.810	358.384	409.000	428.000
E_PSB	264.889	292.964	349.228	170.168	210.276	242.544	290.672
F_PSB	179.909	171.314	370.000	213.140	216.005	221.735	251.138
M_PSB	282.078	394.000	424.000	.	205.692	239.679	322.242
N_PSB	189.076	233.376	269.290	284.943	261.451	274.629	317.945
O_PSB	198.426	206.265	240.252	364.770	114.592	185.821	221.735
N	7	7	7	6	7	7	7
AVG	222.73932	238.53844	301.61702	271.7807	228.94866	265.64225	305.54816
SEM	14.576935	30.468937	31.470275	29.565016	27.601683	26.973195	24.705748

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	213.896	285.515	435.000	193.660	248.273	280.359	330.550
C_PSA	228.610	218.479	276.921	332.842	400.000	416.000	425.000
E_PSA	367.000	367.000	111.336	185.638	216.578	275.202	313.820
F_PSA	223.063	228.610	233.376	174.362	258.586	302.876	305.387
M_PSA	242.361	103.705	74.485	206.447	250.565	284.943	338.915
N_PSA	203.973	228.610	279.213	303.071	333.988	231.084	305.111
O_PSA	196.525	215.432	264.889	407.000	181.628	222.490	243.117
N	7	7	7	7	7	7	7
AVG	239.34681	235.3361	239.31718	257.57422	269.94545	287.56491	323.12835
SEM	22.04847	30.059781	45.128287	34.108135	27.87644	24.086357	20.592462

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	212.750	213.140	252.857	245.408	337.769	358.075	315.309
GWHPB	217.334	220.016	265.852	232.515	272.337	289.526	346.707
HWHPB	240.252	232.048	352.380	169.023	202.254	251.711	282.078
KWHPB	209.885	224.599	283.797	366.000	368.000	410.000	435.000
LWHPB	224.782	249.810	301.949	256.685	310.543	398.000	424.000
NWHPB	187.930	210.848	211.031	239.106	268.327	307.574	333.415
N	6	6	6	6	6	6	6
AVG	215.48873	225.07692	277.97755	251.45622	293.20511	335.8144	356.08486
SEM	7.0742626	5.8625215	19.497064	26.134773	23.949476	25.74203	24.887505

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	244.263	367.000	409.000	197.280	217.151	278.067	329.920
GWHPA	221.917	240.825	324.247	216.188	266.425	313.934	315.309
HWHPA	174.752	403.000	410.000	180.664	216.005	266.608	293.537
KWHPA	201.108	239.496	280.359	357.405	379.000	392.000	323.732
LWHPA	242.934	270.046	341.379	411.000	409.000	435.000	478.000
NWHPA	217.334	225.745	211.994	249.237	277.885	302.704	327.227
N	6	6	6	6	6	6	6
AVG	217.05127	291.01869	329.49659	268.62882	294.24433	331.38556	344.62075
SEM	10.766506	30.652585	31.193812	38.342857	33.395951	27.43249	27.211373

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	202.827	255.722	300.230	305.798	287.625	447.000	478.000
BWPSB	227.074	322.127	133.682	206.265	253.430	273.483	303.506
DWPSB	.	.	.	.	.	.	.
FWPSB	192.514	247.518	366.000	173.216	223.636	262.024	312.262
IWPSB	252.857	278.640	383.000	495.000	422.000	460.000	520.000
N	4	4	4	4	4	4	4
AVG	218.81789	276.00173	295.72789	295.06969	296.67268	360.6269	403.44209
SEM	13.461131	16.726134	56.887195	72.354404	43.773178	53.736865	55.861128

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	221.917	221.735	254.576	142.094	387.000	398.000	445.000
BWPSA	235.668	266.608	192.123	234.522	272.155	311.929	342.869
DWPSA	.	.	.	.	.	.	.
FWPSA	223.063	228.610	233.376	174.362	258.586	302.876	305.387
IWPSA	225.745	229.756	323.273	362.000	379.000	416.000	447.000
N	4	4	4	4	4	4	4
AVG	226.59845	236.67719	250.83722	228.24436	324.18536	357.20124	385.06377
SEM	3.127839	10.132884	27.406169	48.5243	34.10853	29.043994	36.006193

Table 31: Cardiac Output Amplitudes (L/min)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	1.150	0.481	1.020	0.556	0.405	0.600	0.534
D_HPB	0.058	0.073	0.090	0.413	0.397	0.287	0.615
G_HPB	0.521	0.606	0.077	0.625	0.598	0.655	0.392
I_HPB	0.836	0.898	0.783	1.410	1.130	1.970	1.790
J_HPB	0.125	0.092	0.133	0.455	0.281	0.169	0.221
K_HPB	0.445	0.612	0.150	0.204	0.705	0.464	0.792
L_HPB	1.220	0.901	0.603	0.359	0.233	0.213	0.024
N	7	7	7	7	7	7	7
AVG	0.6221714	0.5233429	0.408	0.5745714	0.5355714	0.6225714	0.6240571
SEM	0.1751593	0.1279865	0.1468775	0.1484063	0.1173675	0.2354506	0.2166693

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	1.080	0.390	0.303	0.478	0.092	1.030	0.836
D_HPA	0.127	0.126	0.183	0.254	0.237	0.224	0.251
G_HPA	1.350	0.866	0.330	0.785	0.210	0.396	0.047
I_HPA	0.759	0.828	0.944	0.764	0.853	0.845	0.770
J_HPA	0.256	0.590	0.447	0.349	0.301	0.171	0.011
K_HPA	0.846	0.338	0.335	0.508	0.513	0.949	0.407
L_HPA	.	.	.	.	.	.	.
N	6	6	6	6	6	6	6
AVG	0.7363333	0.523	0.4236667	0.523	0.3676333	0.6025	0.3868667
SEM	0.1922881	0.1189798	0.1096065	0.0878658	0.1124203	0.1563886	0.1443078

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	0.587	0.255	0.145	0.083	0.415	0.304	0.476
C_PSB	0.442	0.252	0.328	0.093	0.101	0.249	0.235
E_PSB	0.223	0.418	0.273	0.785	0.919	0.913	0.824
F_PSB	0.218	0.297	0.149	0.084	0.274	0.108	0.046
M_PSB	0.317	0.251	0.423	.	0.125	0.236	0.259
N_PSB	1.620	1.230	0.715	0.288	0.765	0.257	0.460
O_PSB	1.470	0.802	1.210	0.890	0.625	1.020	0.853
N	7	7	7	6	7	7	7
AVG	0.6967143	0.5007143	0.4632857	0.3705167	0.4605714	0.441	0.4503857
SEM	0.2249391	0.1427255	0.1445154	0.1516779	0.1203819	0.13805	0.1143537

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	0.538	0.223	0.267	0.334	0.533	0.413	0.240
C_PSA	0.256	0.377	0.390	0.283	0.097	0.126	0.335
E_PSA	0.316	0.899	0.599	1.240	1.320	1.440	1.020
F_PSA	0.550	0.515	0.252	0.393	0.571	0.359	0.440
M_PSA	0.492	0.315	0.442	0.506	0.717	0.492	0.401
N_PSA	1.860	1.390	0.825	0.571	0.613	0.187	0.147
O_PSA	2.200	1.890	1.370	0.369	0.658	1.050	1.240
N	7	7	7	7	7	7	7
AVG	0.8874286	0.8012857	0.5921429	0.5280212	0.6441429	0.5809422	0.5461429
SEM	0.3002496	0.2377623	0.1499326	0.124447	0.1363051	0.1829585	0.157051

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	0.623	0.713	0.229	1.160	0.484	0.446	0.483
GWHPB	2.330	1.650	1.010	0.827	1.030	0.479	0.562
HWHPB	0.450	0.461	0.445	0.768	0.441	1.030	0.615
KWHPB	1.180	1.020	0.758	0.184	0.699	0.549	0.606
LWHPB	0.590	0.167	0.455	1.170	1.170	1.180	1.380
NWHPB	0.669	0.573	0.400	1.220	1.360	0.915	0.779
N	6	6	6	6	6	6	6
AVG	0.9736667	0.764	0.5495	0.8881439	0.864	0.7665	0.7375
SEM	0.2897947	0.2111739	0.1155355	0.160985	0.1546784	0.1284717	0.1344616

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	0.229	0.244	0.357	0.499	0.453	0.439	0.599
GWHPA	1.340	1.200	0.109	1.080	0.674	0.429	0.551
HWHPA	0.187	0.241	0.960	1.610	1.320	1.000	1.090
KWHPA	1.170	0.855	0.495	0.257	0.141	0.170	0.177
LWHPA	0.463	0.308	0.543	0.359	1.570	1.750	1.740
NWHPA	0.967	0.723	0.312	0.923	1.170	0.820	1.020
N	6	6	6	6	6	6	6
AVG	0.726	0.5951667	0.4626667	0.788	0.888	0.768	0.8628333
SEM	0.2032168	0.1613376	0.1174429	0.2104516	0.2254109	0.2310568	0.2223318

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	0.644	0.608	0.251	0.287	0.298	0.154	0.236
BWPSB	0.352	0.486	0.630	1.080	0.964	0.697	0.818
DWPSB	.	.	.	.	.	.	.
FWPSB	0.668	0.325	0.367	0.631	0.884	0.501	0.400
IWPSB	0.283	0.378	0.514	0.303	0.316	0.278	0.149
N	4	4	4	4	4	4	4
AVG	0.48675	0.44925	0.4405	0.57525	0.6155	0.4075	0.40075
SEM	0.0988478	0.0626277	0.0829784	0.1859858	0.1788973	0.1202723	0.1484977

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	0.766	0.811	0.198	0.113	0.380	0.153	0.199
BWPSA	0.245	0.496	0.474	0.867	0.629	0.481	0.530
DWPSA	.	.	.	.	.	.	.
FWPSA	0.666	0.672	0.348	0.167	0.128	0.304	0.113
IWPSA	0.466	0.370	0.428	0.380	1.040	1.220	0.782
N	4	4	4	4	4	4	4
AVG	0.53575	0.58725	0.362	0.38175	0.54425	0.5395	0.406
SEM	0.1152464	0.096941	0.0605475	0.1717107	0.1943349	0.2365278	0.154232

Table 32: Cardiac Output Phase Lags (degrees)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	218.297	249.419	270.619	359.700	304.814	353.869	405.000
D_HPB	176.654	41.597	269.290	208.557	227.464	288.380	310.726
G_HPB	233.376	230.329	104.461	232.803	242.544	299.266	319.205
I_HPB	205.692	274.056	410.000	220.016	267.181	348.484	405.000
J_HPB	26.413	316.846	354.912	155.454	189.649	224.026	247.127
K_HPB	200.535	229.366	317.658	309.970	397.000	439.000	442.000
L_HPB	235.668	295.829	405.000	207.984	195.952	178.763	220.589
N	7	7	7	7	7	7	7
AVG	185.23362	233.92018	304.56288	242.06915	260.65755	304.54128	335.66387
SEM	27.561498	34.358883	39.745726	26.189298	27.273113	32.745476	31.95837

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	208.166	199.572	262.597	134.645	199.572	185.065	251.138
D_HPA	31.455	193.660	323.560	221.917	230.329	266.608	296.402
G_HPA	195.379	243.117	288.771	230.329	264.134	244.835	316.742
I_HPA	201.108	251.711	385.000	189.832	191.941	109.617	361.000
J_HPA	.	.	.	.	.	.	.
K_HPA	188.503	176.471	273.874	247.518	303.965	334.274	351.062
L_HPA	.	.	.	.	.	.	.
N	5	5	5	5	5	5	5
AVG	164.92229	212.90603	306.76032	204.84812	237.988	228.08007	315.26865
SEM	33.523508	14.653047	22.08982	19.893834	20.846247	38.030242	19.803257

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	183.529	124.905	254.003	299.084	203.010	239.679	288.198
C_PSB	185.065	241.398	323.148	392.000	445.000	449.000	445.000
E_PSB	258.014	337.024	420.000	187.357	216.005	243.117	296.975
F_PSB	166.731	190.795	390.000	240.642	213.140	236.632	290.099
M_PSB	337.540	454.000	437.000	.	221.162	305.741	384.000
N_PSB	195.379	231.657	265.279	264.316	271.192	283.797	335.821
O_PSB	185.638	261.451	247.127	122.613	214.859	231.657	245.226
N	7	7	7	6	7	7	7
AVG	215.98508	263.03294	333.79397	251.00208	254.90962	284.23172	326.4741
SEM	23.054269	40.147309	30.832648	37.864365	32.766951	29.405481	25.683366

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	196.525	251.711	426.000	188.503	241.398	276.348	329.232
C_PSA	205.692	263.170	345.905	409.000	328.717	434.000	424.000
E_PSA	351.406	379.000	105.607	183.919	216.578	276.348	317.372
F_PSA	173.033	196.525	257.441	170.351	251.138	303.621	319.710
M_PSA	275.020	89.381	73.912	217.334	258.014	309.121	378.000
N_PSA	199.389	232.048	269.473	265.111	337.311	239.106	420.000
O_PSA	202.827	222.881	263.743	207.593	195.952	220.198	244.835
N	7	7	7	7	7	7	7
AVG	229.12734	233.53079	248.86855	234.54452	261.30089	294.10612	347.59286
SEM	23.600273	32.599457	46.966256	31.318318	20.179714	26.278892	24.197779

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	202.254	207.411	208.739	262.597	349.916	364.000	312.273
GWHPB	209.312	215.432	272.728	239.591	270.619	307.402	371.000
HWHPB	234.522	181.628	395.000	170.741	219.052	255.722	302.131
KWHPB	214.469	225.745	284.943	318.747	360.000	403.000	430.000
LWHPB	224.209	351.921	116.883	245.226	327.456	390.000	416.000
NWHPB	183.346	205.692	205.874	223.636	259.159	295.256	336.738
N	6	6	6	6	6	6	6
AVG	211.35211	231.30483	247.36122	243.42308	297.70039	335.89665	361.35697
SEM	7.2643379	24.850192	38.336372	19.776612	23.019876	23.882668	21.843207

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	140.375	350.489	407.000	218.479	243.507	298.121	368.000
GWHPA	214.286	245.408	390.000	232.803	299.839	328.659	321.383
HWHPA	111.154	58.442	52.025	183.529	222.881	271.192	301.558
KWHPA	195.379	240.825	287.234	298.121	331.524	360.000	361.000
LWHPA	181.628	258.586	358.774	380.000	372.000	405.000	470.000
NWHPA	197.853	208.557	182.201	211.421	266.425	292.964	324.477
N	6	6	6	6	6	6	6
AVG	173.44564	227.05115	279.5389	254.05896	289.36274	325.98921	357.73626
SEM	16.109656	38.956922	56.575291	29.61571	22.923782	20.229255	24.700132

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	203.400	249.419	276.166	300.985	290.490	420.000	465.000
BWPSB	294.110	63.598	118.212	204.546	258.586	275.775	326.998
DWPSB	.	.	.	.	.	.	.
FWPSB	186.211	247.518	370.000	166.913	224.209	263.170	313.408
IWPSB	345.848	319.778	405.000	159.855	382.000	408.000	463.000
N	4	4	4	4	4	4	4
AVG	257.39227	220.0784	292.34437	208.07493	288.82127	341.73633	392.10139
SEM	37.809262	54.802599	64.099913	32.486184	33.879624	41.872419	41.605271

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	213.323	219.443	205.874	202.827	344.989	386.000	434.000
BWPSA	279.786	72.193	153.162	251.138	272.728	331.467	370.000
DWPSA	.	.	.	.	.	.	.
FWPSA	207.020	241.788	307.517	148.969	185.821	237.960	173.216
IWPSA	189.076	254.003	330.607	347.785	381.000	420.000	432.000
N	4	4	4	4	4	4	4
AVG	222.30126	196.85663	249.29023	237.67987	296.13431	343.85667	352.30394
SEM	19.837925	42.166107	41.96065	42.218358	43.114036	39.729801	61.516552

Table 33: End Diastolic Volume Amplitudes (mL)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	23.700	23.200	25.900	16.700	18.100	17.200	12.600
D_HPB	11.500	6.990	4.720	8.980	12.200	12.100	12.500
G_HPB	13.700	10.400	15.600	18.800	26.600	17.800	8.770
I_HPB	22.900	31.400	32.300	29.900	28.600	33.100	18.600
J_HPB	3.520	4.450	3.530	10.800	8.040	5.880	2.980
K_HPB	11.900	7.370	3.290	3.840	14.000	10.700	16.500
L_HPB	20.700	29.300	6.030	8.990	10.600	4.680	3.270
N	7	7	7	7	7	7	7
AVG	15.417143	16.158571	13.052857	14.001429	16.877143	14.494286	10.745714
SEM	2.7805119	4.3263684	4.4900545	3.2619965	3.0123	3.6353967	2.2960296

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	20.500	14.800	10.500	14.700	14.300	16.600	18.200
D_HPA	4.810	3.320	4.530	5.760	6.470	4.480	6.790
G_HPA	21.800	20.000	19.200	20.400	14.800	11.300	7.720
I_HPA	18.900	6.780	18.900	28.500	28.500	15.000	18.700
J_HPA	.	.	.	.	.	.	.
K_HPA	13.200	2.700	9.500	15.500	17.200	27.400	14.800
L_HPA	.	.	.	.	.	.	.
N	5	5	5	5	5	5	5
AVG	15.842	9.52	12.526	16.972	16.254	14.956	13.242
SEM	3.1243502	3.3924092	2.8492764	3.7261487	3.5532965	3.7461361	2.5388942

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	12.500	8.670	4.280	6.870	10.200	8.290	12.200
C_PSB	3.380	6.030	8.030	7.660	7.430	7.600	6.370
E_PSB	14.300	14.200	11.700	26.000	30.100	30.500	27.900
F_PSB	4.400	6.750	2.140	5.020	3.870	2.310	1.890
M_PSB	16.000	17.500	9.200	.	6.650	6.540	8.590
N_PSB	50.700	41.100	25.100	17.900	26.300	12.800	21.200
O_PSB	29.400	24.100	39.700	11.400	5.780	19.700	18.100
N	7	7	7	6	7	7	7
AVG	18.668571	16.907143	14.307143	12.475	12.904286	12.534286	13.75
SEM	6.2540758	4.7158344	5.0759671	3.2847585	4.0352865	3.6417342	3.4461835

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	5.930	3.330	8.600	12.900	17.800	11.800	7.880
C_PSA	2.500	2.360	10.900	9.550	7.730	10.525	1.530
E_PSA	19.400	24.400	20.400	32.100	30.900	24.800	21.000
F_PSA	2.400	5.220	8.640	7.870	14.200	12.200	12.800
M_PSA	3.880	11.200	6.600	14.800	31.100	18.200	12.500
N_PSA	49.200	40.700	22.200	11.536	17.500	9.960	6.870
O_PSA	35.900	39.000	22.600	9.690	15.500	25.900	32.200
N	7	7	7	7	7	7	7
AVG	17.03	18.03	14.277143	14.063755	19.247143	16.197818	13.54
SEM	7.1011283	6.2993397	2.6898484	3.1299511	3.2862822	2.575324	3.8614117

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	14.500	9.580	8.230	32.900	8.700	11.900	11.200
GWHPB	59.700	39.200	30.300	21.229	25.000	21.200	19.900
HWHPB	24.800	3.800	9.600	22.800	13.700	27.800	22.900
KWHPB	24.200	16.200	19.900	9.430	16.400	17.600	16.300
LWHPB	29.400	18.100	7.060	15.500	9.690	16.800	13.200
NWHPB	8.550	15.900	15.600	23.900	31.400	19.800	24.400
N	6	6	6	6	6	6	6
AVG	26.858333	17.13	15.115	20.959875	17.481667	19.183333	17.983333
SEM	7.266962	4.9162825	3.6350935	3.2527824	3.6676245	2.1596939	2.1660127

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	7.070	14.200	13.100	15.300	14.200	11.800	9.930
GWHPA	38.800	24.100	5.360	36.200	23.300	17.500	15.500
HWHPA	10.600	14.700	21.400	42.700	47.900	26.200	32.500
KWHPA	22.600	20.900	17.500	8.830	7.900	9.780	5.310
LWHPA	12.500	18.700	22.900	17.400	20.500	33.300	23.700
NWHPA	24.000	14.000	13.800	15.100	21.700	17.200	21.900
N	6	6	6	6	6	6	6
AVG	19.261667	17.766667	15.676667	22.588333	22.583333	19.296667	18.14
SEM	4.7774613	1.7040475	2.6131229	5.5231696	5.5750884	3.6429856	4.0424555

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	14.000	11.300	7.950	3.230	5.060	4.450	5.130
BWPSB	20.600	7.270	20.400	25.500	28.400	21.400	21.600
DWPSB	.	.	.	.	.	.	.
FWPSB	8.510	4.290	6.420	19.100	22.900	13.100	11.200
IWPSB	22.300	10.000	15.300	8.610	4.530	9.230	7.110
N	4	4	4	4	4	4	4
AVG	16.3525	8.215	12.5175	14.11	15.2225	12.045	11.26
SEM	3.1682418	1.5546195	3.2649359	5.0270651	6.1250611	3.5851232	3.6710421

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	25.300	17.200	8.630	10.300	5.680	3.330	4.040
BWPSA	25.700	9.480	13.300	27.200	27.800	13.200	16.400
DWPSA	.	.	.	.	.	.	.
FWPSA	17.200	12.400	13.700	5.670	4.150	9.110	2.640
IWPSA	18.300	12.700	4.590	18.700	24.100	29.700	22.400
N	4	4	4	4	4	4	4
AVG	21.625	12.945	10.055	15.4675	15.4325	13.835	11.37
SEM	2.2499537	1.5934318	2.1547022	4.7503919	6.1270349	5.662612	4.8036757

Table 34: End Diastolic Volume Phase Lags (degrees)

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPB	230.902	236.814	258.586	352.150	328.305	28.648	437.000
D_HPB	112.300	99.122	202.827	201.681	227.464	312.846	356.047
G_HPB	298.121	234.340	157.746	268.327	288.380	330.722	365.000
I_HPB	212.567	270.046	400.000	206.838	239.679	335.592	389.000
J_HPB	40.955	319.758	110.963	187.992	259.873	293.517	326.064
K_HPB	183.346	217.151	113.628	303.668	404.000	463.000	490.000
L_HPB	245.408	247.127	415.000	298.511	240.642	236.059	385.000
N	7	7	7	7	7	7	7
AVG	189.08559	232.05101	236.96442	259.88091	284.04905	285.769	392.58718
SEM	32.817202	25.487378	48.125289	23.585424	23.906939	50.068876	20.732899

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
A_HPA	203.010	166.158	231.657	223.454	286.088	283.797	330.149
D_HPA	248.273	58.442	292.208	235.095	228.610	337.597	335.420
G_HPA	218.479	251.711	260.696	260.878	291.245	278.640	364.000
I_HPA	236.814	241.398	376.000	214.469	214.859	436.000	351.520
J_HPA	.	.	.	.	.	.	.
K_HPA	210.848	406.000	206.838	241.215	269.863	319.263	348.025
L_HPA	.	.	.	.	.	.	.
N	5	5	5	5	5	5	5
AVG	223.48495	224.74163	273.4799	235.0222	258.13319	331.05933	345.82288
SEM	8.3549441	56.985571	29.338418	7.9472523	15.426817	28.439411	6.0066998

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSB	239.106	166.158	188.113	296.792	270.046	332.555	363.700
C_PSB	169.596	164.439	253.247	321.784	366.000	84.798	122.040
E_PSB	389.000	363.000	465.000	210.848	252.857	294.683	337.196
F_PSB	49.733	154.699	93.392	279.786	288.771	301.558	303.850
M_PSB	375.000	76.959	104.851	.	250.383	265.462	380.000
N_PSB	194.233	229.183	259.550	279.786	291.818	325.737	379.000
O_PSB	207.593	200.535	251.711	397.000	233.194	231.657	275.593
N	7	7	7	6	7	7	7
AVG	232.03715	193.56749	230.83775	297.66602	279.00966	262.35011	308.76845
SEM	44.797486	33.356848	47.102612	24.917431	16.554078	32.369126	34.44262

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
B_PSA	219.625	68.182	117.066	240.642	298.694	331.581	402.000
C_PSA	357.101	162.147	245.981	325.508	385.000	446.000	482.000
E_PSA	381.000	414.000	479.000	223.454	255.539	335.592	386.000
F_PSA	226.501	158.709	207.593	220.771	304.423	346.535	362.000
M_PSA	293.927	118.602	121.467	238.533	287.234	343.098	399.000
N_PSA	200.535	226.891	271.765	270.765	341.837	290.099	361.000
O_PSA	194.233	205.119	262.597	183.919	241.788	279.786	288.953
N	7	7	7	7	7	7	7
AVG	267.56032	193.37868	243.63846	243.3704	302.07365	338.95594	382.99332
SEM	29.046036	41.798212	45.980528	16.881748	18.577295	20.404723	21.928886

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPB	[redacted]						
EWHPB	247.127	208.557	176.654	239.679	335.134	351.291	319.320
GWHPB	211.031	220.589	253.820	216.487	264.316	266.035	339.488
HWHPB	261.451	139.802	392.000	182.201	215.042	255.149	286.661
KWHPB	211.031	223.454	274.629	365.000	367.000	407.000	437.000
LWHPB	227.647	256.112	386.000	242.361	308.824	411.000	429.000
NWHPB	159.855	197.097	194.988	225.355	265.462	298.121	331.123
N	6	6	6	6	6	6	6
AVG	219.69042	207.60171	279.68188	245.18038	292.6296	331.43254	357.09874
SEM	14.48019	15.791661	37.594825	25.545895	22.479204	28.072251	25.118075

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
CWHPA	[redacted]						
EWHPA	352.380	385.000	82.506	200.718	229.756	282.651	325.336
GWHPA	234.522	242.544	394.000	207.020	264.134	313.590	313.017
HWHPA	62.452	67.609	45.951	183.529	215.432	274.629	293.537
KWHPA	200.535	238.350	274.056	332.842	365.000	387.000	321.325
LWHPA	238.923	281.505	343.384	63.025	413.000	437.000	479.000
NWHPA	220.771	220.589	193.660	243.507	274.447	302.991	327.399
N	6	6	6	6	6	6	6
AVG	218.26403	239.26611	222.25957	205.10687	293.62809	332.97685	343.26908
SEM	37.980698	41.971837	57.237089	35.808041	32.028995	26.42693	27.608165

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSB	198.816	256.295	309.397	277.494	281.322	454.000	478.000
BWPSB	227.647	376.000	126.806	202.827	251.138	272.910	303.678
DWPSB	.	.	.	.	.	.	.
FWPSB	190.795	260.123	47.326	176.654	220.198	262.597	309.970
IWPSB	263.170	320.122	400.000	169.023	398.000	457.000	504.000
N	4	4	4	4	4	4	4
AVG	220.10705	303.1349	220.88242	206.4993	287.66465	361.6269	398.9121
SEM	16.390469	28.345982	81.081253	24.747091	38.837287	54.241988	53.446638

	0.01 Hz	0.02 Hz	0.04 hz	0.08 Hz	0.10 Hz	0.125 Hz	0.15 Hz
AWPSA	222.490	230.329	246.554	145.531	364.000	384.000	435.000
BWPSA	240.825	288.380	168.059	232.230	275.593	312.215	341.723
DWPSA	.	.	.	.	.	.	.
FWPSA	215.615	241.788	284.943	145.531	191.550	225.928	216.188
IWPSA	232.803	233.767	358.722	364.000	370.000	410.000	450.000
N	4	4	4	4	4	4	4
AVG	227.93323	248.56607	264.56958	221.82324	300.28578	333.0358	360.72756
SEM	5.562414	13.486782	39.705799	51.610292	42.182839	41.257764	53.804393

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VITA

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