REVIEWS

SOTHMANN, et. al., (1995). Selected psycho-physiological stress responses in men with high and low body fatness. Previous research on catecholamine (CA) response to exercise has linked heightened adiposity to a hypo-stress syndrome. In the present study a cognitive/psychomotor stressor was employed to determine whether this association exists during less metabolically challenging tasks. Moreover, because stress is manifested in a multidimensional manner, measures of behavior and perceived distress were analyzed in addition to the physiological response. Men were selectively recruited for two body fatness groups (low, 12 +/- 4%, N = 9; high, 27 +/- 2%, N = 10) while being matched on age, lean weight, and peak absolute oxygen consumption. All men performed a modified Stroop task for 12 min to induce a psycho-physiological stress response. Physiological changes included significant increases in heart rate, venous plasma nor-epinephrine, and epinephrine. Cognitive/psychomotor responses indicated no change in reaction time during the task but significant cognitive fatigue as indicated by post-task anagram performance. Perceived distress was suggested by elevated stale anxiety. The high and low adiposity groups were similar on all measures of the psycho-physiological stress response. These findings suggest that elevated adiposity is not characterized by a hypo-stress state during the relatively low metabolic challenge of a cognitive/psychomotor stressor.

Mc CARTHY., et.al. (1995), Compatibility of adaptive responses with combining strength and endurance trainin Impairment in strength development has been demonstrated with combined strength and endurance training as compared with strength training alone. The purpose of this study was to examine the effects of combining conventional 3 d[middle dot]wk-1 strength and endurance training on the compatibility of improving both [latin capital V with dot above]O2peak and strength performance simultaneously. Sedentary adult males, randomly assigned to one of three groups (N =
10 each), completed 10 wk of training. A strength-only (S) group performed eight weight-training exercises (4 sets/exercise, 5-7 repetitions/set), an endurance-only (E) group performed continuous cycle exercise (50 min at 70% heart rate reserve), and a combined (C) group performed the same S and E exercise in a single session. S and C groups demonstrated similar increases (P < 0.0167) in 1RM squat (23% and 22%) and bench press (18% for both groups), in maximal isometric knee extension torque (12% and 7%), in maximal vertical jump (6% and 9%), and in fat-free mass (3% and 5%). E training did not induce changes in any of these variables. \[\text{O}_2\text{peak} \text{ (ml \cdot kg}^{-1}\text{min}^{-1}) \text{ increased (P < 0.01) similarity in both E (18%) and C (16%) groups. Results indicate 3 d \cdot wk}^{-1} \text{ combined training can induce substantial concurrent and compatible increases in } \text{O}_2\text{peak and strength performance.}\]

PYNE, D. B., M et. al., (1995), The effects of an intensive 12-wk training program by 12 national-level swimmers on neutrophil oxidative activity were studied. Eleven sedentary (untrained) subjects (6 males and 5 females) served as environmental controls. Blood samples (10 ml) were taken at rest from an antecubital vein and neutrophils isolated by standard separation techniques. The oxidative burst activity of isolated neutrophils was assessed with an in vitro flow cytometric assay that used the fluorescent probe dihydrorhodamine 123. Two-way ANOVA (repeated measures) showed that oxidative activity was lower (P < 0.05) in the elite swimmers compared with the sedentary control group across the 12-wk period. Analysis of cells from swimmers in training was made: repeated measures ANOVA provided evidence of a significant decline (P < 0.05) in the number of cells responding positively to in vitro challenge. Despite this decline, there was no significant difference in self-reported upper respiratory tract infection rate between the swimmers and sedentary individuals. These data show that: (i) elite swimmers undertaking intensive training have a
significantly lower neutrophil oxidative activity at rest than do age- and sex-matched sedentary individuals; (ii) aspects of oxidative activity in swimmers are further suppressed during periods of strenuous training, and (iii) the extent of the suppression does not appear to be of clinical significance.

EL-SAYED, M. S. and B. DAVIES. A physical conditioning program does not alter fibrinogen concentration in young healthy subjects. Twenty five subjects were divided into experimental (N = 13, 7 male and 6 female, age 32.1 +/- 6.4 yr) and control groups (N = 12, 6 male and 6 female, age 33.4 +/- 5.4 yr) in order to examine the effect of a conditioning program on fibrinogen concentration. Before and after conditioning, [latin capital V with dot above] O2max was determined in all subjects. The experimental group (E) exercised for 30 min, 3 d[wk-1] for 12 wk at 70% (initial 6 wk) and 80% (latter 6 wk) of maximum heart rate. The control group (C) maintained normal activity pattern. After conditioning, subjects in E, but not in C, increased (P > 0.001) their [latin capital V with dot above] O2max. Resting fibrinogen concentrations (RFC) before conditioning were similar between the two groups, and demonstrated no change in the C group (242.9 +/- 40.3 mg [middle dot] dl-1 vs 247.4 +/- 38.7 mg [middle dot]dl-1, P > 0.05) after conditioning. Although RFC showed a 6% decrease in the E group post conditioning (249.1 +/- 21.5 mg [middle dot]dl-1 vs 236.4 +/- 34.6 mg[middle dot]dl-1), this decrease was not significant (P > 0.05). A significant increase (P < 0.05) in fibrinogen concentrations were observed after maximal exercise in both groups pre and post conditioning; however, this increase disappeared (P > 0.05) when data were corrected for hemoconcentration. These results suggest that after conditioning the 6% decrease in RFC was not statistically significant, but the possibility of Type II error is high.

RUBINSTEIN, A., R. BURSTEIN, F. LUBIN, A. CHETRIT, E. J. DANN, O. LEVTOV, R. GETER, P. A. DEUSTER, and E. DOLEV. Lipoprotein profile changes during intense training of
Israeli military recruits. The effect of prolonged strenuous military training on serum lipoproteins was studied in 73 new recruits. Dietary intake, body weight, and average energy expenditure were recorded, and blood samples collected at three time periods before training began (time 0), and after 6 and 12 wk of intense physical activity (times I and II, respectively). There was a significant increase in high density lipoprotein (HDL) cholesterol and a decrease in low density lipoprotein (LDL) cholesterol accompanying an increase of duration and intensity of exercise. HDL increased from 40.5 +/- 7.7 mg[dot]dl-1 at time 0 to 44.5 +/- 9.4 mg[dot]dl-1 at time 1 and to 52.8 +/- 8.7 mg[dot]dl-1 at time II, and each mean P-value for increases in HDL from time 0-I, I-II, and 0-II were P < 0.0001). For LDL cholesterol, the mean decreases were -1.1, -6.1, and -7.3 mg [middle dot] dl-1, respectively (P = 0.003 from 1-11, and 0.01 from 0-11). These changes did not correlate with weight loss, reduced energy, or fat intake. We conclude that intense physical activity is associated with beneficial changes in the lipoprotein profile in new military recruits during a training period extending over 12 wk.

HUBINGER, L., L. T. MACKINNON, and F. LEPRE. (1995), Lipoprotein (a) [Lp (a)] levels in middle-aged male runners and sedentary controls Serum Lipoprotein (a) [Lp(a)] concentration was compared between middle-aged well-trained Caucasian male endurance runners (N = 57), (mean age +/- SEM 47.8 +/- 0.7 yr) and age-, body mass-, and body mass index (BMI)- matched male nonathletic control subjects (N = 62), (mean age +/- SEM 48.7 +/- 0.8). The mean weekly training distance of the runners was (60.7 +/- 2.8 km [middle dot]wk-1) at the time of testing. Median Lp(a) levels were not significantly different (P > 0.05) between the runners (15.0 mg[middle dot]dl-1), and the control subjects (12.5 mg[middle dot]dl-1). As expected, compared with control subjects, in runners levels of other lipoproteins and apoproteins were significantly more favorable for cardiovascular health (all P [less than or greater than] 0.01). There was no significant relationship
between Lp(a) and any other measured variable (lipid, anthropometric, or dietary) in the runners group. In the control group, the significant positive correlation between Lp(a) and LDL-C was no longer significant after correction for the estimated contribution of Lp(a) cholesterol to LDL-C. These cross-sectional data suggest that a lifestyle of moderate to intense exercise training does not exert a significant impact on the Lp(a) level.

HARTUNG, G. HARLEY; BLANCQ, ROBERTA J.; LALLY, DAVID A.; KROCK, LARRY P. (1995), Estimation of aerobic capacity from sub-maximal cycle ergometry in women. Simple, valid, and reliable methods of estimating maximal oxygen uptake. ([\text{\text{Latin capital V with dot above}}] O2max) are needed for epidemiologic studies of physical activity, to evaluate fitness for job performance, and to assist in prescription of exercise. Such estimations in women have not received due research attention. Heart rate responses to submaximal cycle ergometry and [\text{\text{Latin capital V with dot above}}]O2max during maximal treadmill and cycle ergometer testing were measured in 37 healthy women aged 19-47 yr (X = 31.7 +/- 7.9). The submaximal test was very reliable on retest (r = 0.92), but overestimated measured treadmill [\text{\text{Latin capital V with dot above}}]O2max ([\text{\text{Latin capital letter X with macron above}}] = 2.42 vs 2.23 \text{[middle dot]} \text{min}^{-1}; r = 0.76, \text{SEE} = 0.229). The submaximal test also greatly overestimated maximal cycle ergometer [\text{\text{Latin capital V with dot above}}] O2max ([\text{\text{Latin capital letter X with macron above}}] = 2.42 vs 2.06 \text{[middle dot]} \text{min}^{-1}; r = 0.70, \text{SEE} = 0.340). Similar 8.5% (treadmill) and 18.5% (cycle ergometer) overestimations by the submaximal test were found for [\text{\text{Latin capital V with dot above}}] O2max relative to body weight. A simple submaximal exercise test is highly reliable as an estimate of [\text{\text{Latin capital V with dot above}}] O2max when used for women. It also provides a reasonably good estimate of treadmill measured [\text{\text{Latin capital V with dot above}}] O2max.
BELARDINELLI, R. et.al., (1995). Skeletal muscle oxygenation during constant work rate exercise. They compared the slow rise in $[\text{\dot{V}O}_2]$ during heavy exercise (i.e., greater than lactic acidosis threshold (LAT)) with changes in muscle oxyhemoglobin + oxymyoglobin ($\text{O}_2\text{Hb}/\text{O}_2\text{Mb}$) saturation by reflectance near infrared spectroscopy. Ten subjects performed four 6-min cycle ergometer tests with two constant work rates less than and two greater than the LAT, equivalent to 20, 40, 65 and 75% peak $[\text{\dot{V}O}_2]$. During less than LAT exercise, $\text{O}_2\text{Hb}/\text{O}_2\text{Mb}$ saturation decreased to a minimum by 2 min and then remained constant or rose slightly. For greater than LAT work rates, the initial fall in $\text{O}_2\text{Hb}/\text{O}_2\text{Mb}$ saturation was greater the higher the work rate and continued to decrease with time after 3 min. Between minutes 3 and 6, the rate of decrease in $\text{O}_2\text{Hb}/\text{O}_2\text{Mb}$ saturation correlated with the increase in $[\text{\dot{V}O}_2]$ ($r = -0.69, P < 0.0001$). These studies support the hypothesis that the slow rise in $[\text{\dot{V}O}_2]$ during heavy constant work rate exercise is associated with a progressive decline in $\text{O}_2\text{Hb}/\text{O}_2\text{Mb}$ saturation in the contracting muscles themselves that may be facilitated by capillary oxyhemoglobin dissociation owing to tissue lactic acidosis (Bohr effect).

WHEELER, D. L., et.al. (1995), Effects of running on the torsional strength, morphometry, and bone mass of the rat skeleton. Intensity and duration effects of weight-bearing exercise on the rat skeleton were investigated. Eighty-four 3-month-old female Sprague-Dawley rats were assigned to control and nine exercise groups. Exercised rats were run on a treadmill for either 30, 60, or 90 min[\text{d-1}] at low ($\text{VO}_2\text{max} +/ - 55\%$), medium ($\text{VO}_2\text{max} +/ - 65\%$), or high ($\text{VO}_2\text{max} +/ - 75\%$) intensity 4 d[\text{wk-1}] for 10 wk. Rat femurs, tibias, and vertebrae were harvested for torsional mechanical tests, bone density assessment, and morphometry. Our results indicate exercise has a significant effect ($P < 0.05$) on the femoral mechanical response (energy absorbed and twist
angle), tibial morphometry (cortical bone area and thickness), and tibial and vertebral bone density measurements but had no effect (P > 0.05) on bone strength when compared with control values. Higher intensity exercise decreased tibial and femoral torque (P < 0.05). Long duration exercise increased tibial and femoral stiffness and decreased twist angle and energy absorbed (P < 0.05). These results indicate bone adapts to its loading environment by increasing bone mineral density, increasing cortical bone area, increasing stiffness, decreasing energy absorbed, and decreasing twist angle. High-intensity exercise decreased the maximum force the bone could withstand, whereas long duration exercise made the bone more brittle.

Lynn Lavallée, BA and Frances Flint, (1996). the Relationship of Stress, Competitive Anxiety, Mood State, and Social Support to Athletic Injury. They examined the role of stress, competitive anxiety, mood state, and social support in athletic injury. Specifically, we hypothesized that athletes reporting high levels of stress, high competitive trait anxiety, negative mood state, and low social support would exhibit greater incidence of injury and injury severity. Correlational analysis. Major Canadian University. Voluntary sample, 55 male varsity athletes (42 football, 81% of the football team, and 13 rugby, 74% of the rugby team), ages 19-28 yr (x = 22). The inventories Sport Competition Anxiety Test (SCAT), Social Support Scale, Social Athletic Readjustment Rating Scale (SARRS), and Profile of Mood States (POMS) were administered. Internal consistency of the self-report measures was tested using Cronbach's alpha coefficient. Injury rate and severity were recorded by the head student therapist throughout the season. Correlational analyses performed using Pearson correlational coefficient revealed that competitive anxiety (r = .29, p = .03) and tension/anxiety mood states (r = .43, p = .001) were related to injury frequency, and that tension/anxiety (r = .44, p = .008), anger/hostility (r = .30, p = .02), and total negative mood state (r = .28, p = .038) were related to injury severity. Individually, the two sports yielded somewhat
different results: for football, injury frequency and injury severity were related to tension/anxiety ($r = .43$, $p = .004$ and $r = .47$, $p = .002$, respectively). Vigor/activity was found to be significantly related to injury rate ($p = .02$), but since the internal consistency of vigor/activity was less than .70 on the Cronbach alpha scale, this significant finding was disregarded. In rugby, injury frequency was related to tension/anxiety ($r = .58$, $p = .04$) and depression/dejection ($r = .57$, $p = .04$). These findings are useful for athletic trainers in identifying athletes who may possess psychological factors predisposing them to athletic injury. Subsequently, athletic trainers can instruct these athletes or refer them for assistance in psychological preventive interventions.

Todd A Ryska, Zenong Yin, (1998). Effects of trait and situational self-handicapping on competitive anxiety among athletes The purpose of the study was to assess if athletes who perceived their anxiety as debilitative to performance also scored higher on ratings of coping styles used to handle trait shame. The sample was comprised of 94 participants (males = 44, females = 50) ranging in age from 15 to 24 years ($M = 18.8$, $SD = 2.3$). Athletes in high school ($n = 21$) and college ($n = 73$) representing several sports were surveyed for this study. Competitive sport experience averaged 11 yr. ($SD = 3.9$) overall. The Competitive Trait Anxiety Inventory-2D was given to collect general anxiety perceptions related to the athlete's specific sport. The Compass of Shame Scale-Sport was administered to measure coping styles for trait shame responses connected with competitive sport experiences. The athletes were divided into Facilitative ($n = 39$) and Debilitative anxiety groups ($n = 55$) based on the overall direction of anxiety scores. Multivariate analysis of variance indicated no interaction, but did reveal significant main effects for sex and anxiety group. Univariate tests indicated significant differences for several of the shame and anxiety subscales based on sex and anxiety group.
Raghuraj P; et.al. ,(1997). "Pranayama increases grip strength without lateralized effects." The present study was conducted to determine whether breathing through a particular nostril has a lateralized effect on hand grip strength. 130 right hand dominant, school children between 11 and 18 yrs of age were randomly assigned to 5 groups. Each group had a specific yoga practice in addition to the regular program for a 10 day yoga camp. The practices were: (1) right-, (2) left-, (3) alternate-nostril breathing (4), breath awareness and (5) practice of mudras. Hand grip strength of both hands was assessed initially and at the end of 10 days for all 5 groups. The right-, left- and alternate-nostril breathing groups had a significant increase in grip strength of both hands, ranging from 4.1% to 6.5%, at the end of the camp though without any lateralization effect. The breath awareness and mudra groups showed no change. Hence the present results suggest that yoga breathing through a particular nostril, or through alternate nostrils increases hand grip strength of both hands without lateralization.

Jan Filipovsk, Pierre Ducimetiere, and Michel E. Safar, (1992)*, Prognostic Significance of Exercise Blood Pressure and Heart Rate in Middle-aged Men, Systolic blood pressure and heart rate measured at rest and during a standardized exercise test were analyzed in the cohort of middle-aged male employees followed-up an average of 17 years in the Paris Prospective Study I. The population sample selected for the analysis included 4,907 men who completed at least 5 minutes of bicycle ergo-meter, who had no heart disease at entry, and whose resting blood pressure was ≤ 180/105 nun Hg. Exercise-induced increase in systolic blood pressure was positively correlated with resting systolic blood pressure (r=0.104, p<0.0001), whereas the correlation of exercise induced heart rate increase with resting heart rate was negative (r = -0.169, p<0.0001). Using Cox regression analysis with the inclusion of resting systolic blood pressure and heart rate; exercise-induced elevations of systolic blood pressure and heart rate; and controlling for age, smoking, total

* Jan Filipovsk, Pierre Ducimetiere, and Michel E. Safar, (1992), “Prognostic Significance of Exercise Blood Pressure and Heart Rate in Middle-aged Men” Hypertension pp333-33
cholesterol, body mass index, electrical left ventricular hypertrophy, and sports activities, cardiovascular mortality was found to be associated with the systolic blood pressure increase (p<0.05), whereas no association with resting systolic blood pressure was found. Total mortality was predicted by resting systolic blood pressure and its elevation (p<0.01 for both) and by resting heart rate (p<0.0001). The heart rate increase did not contribute to death prediction. In conclusion, the magnitude of the exercise-induced increase of systolic blood pressure, but not of heart rate, may represent a risk factor for death from cardiovascular as well as non cardiovascular causes, independently of resting blood pressure and heart rate.

KEY WORDS • blood pressure • heart rate • exercise test • prospective studies • mortality

Kevin S. Heffernan, et.al. (2011), Relation of Pulse Pressure to Blood Pressure Response to Exercise in Patients With Hypertrophic Cardio-myopathy. Almost one third of patients with hypertrophic cardiomyopathy (HC) will have an abnormal blood pressure response (ABPR) to exercise, and this has been associated with a greater risk of sudden cardiac death. In the present study, they examined the association between the steady (mean arterial pressure) and pulsatile (pulse pressure) blood pressure components as they relate to ABPR in patients with HC (n = 70). All patients completed a standard Bruce protocol during symptom-limited stress testing with concurrent hemodynamic measurements. Pulse pressure (PP) was significantly greater in patients with HC with an ABPR (n = 19) than in the patients with HC without an ABPR to exercise (p <0.05). According to binary logistic regression analysis, PP at rest was a significant predictor of ABPR in patients with HC (p <0.05). Mean arterial pressure was not significantly different between the 2 groups, nor was it a predictor of an ABPR in the presence of HC. Those within the greatest tertile of PP at rest were 4.8 times more likely to have an ABPR than those within the lowest PP tertile (95% confidence interval 1.24 to 18.2, p <0.05). In conclusion, elevations in PP at rest might identify patients with HC at a greater risk of having an ABPR during exercise.
Shigehiko Ogoh, et. al, (2009) Dynamic cerebral autoregulation during and after handgrip exercise in humans. The purpose of the present study was to examine the effect of static exercise on dynamic cerebral auto regulation (CA). In nine healthy subjects at rest before, during, and after static handgrip exercise at 30% maximum voluntary contraction, the response to an acute drop in mean arterial blood pressure and middle cerebral artery mean blood velocity was examined. Acute hypotension was induced non pharmacologically via rapid release of bilateral thigh occlusion cuffs. Subjects were instructed to avoid executing a Valsalva maneuver during handgrip. To quantify dynamic CA, the rate of regulation (RoR) was calculated from the change in cerebral vascular conductance index during the transient fall in blood pressure. There was no significant difference in RoR between rest (mean ± SE; 0.278 ± 0.052/s), exercise (0.333 ± 0.053/s), and recovery (0.305 ± 0.059/s) conditions ($P = 0.747$). In addition, there was no significant difference in the rate of absolute cerebral vaso-dilatory response to acute hypotension between three conditions ($P = 0.737$).

This finding indicates that static exercise and related elevations in blood pressure do not alter dynamic CA.

Shigehiko Ogoh and Philip N. Ainslie, (2009), cerebral blood flow during exercise mechanisms of regulation. The response of cerebral vasculature to exercise is different from other peripheral vasculature; it has a small vascular bed and is strongly regulated by cerebral autoregulation and the partial pressure of arterial carbon dioxide ($P_{aCO_2}$). In contrast to other organs, the traditional thinking is that total cerebral blood flow (CBF) remains relatively constant and is largely unaffected by a variety of conditions, including those imposed during exercise. Recent research, however, indicates that cerebral neuronal activity and metabolism drive an increase in CBF during exercise. Increases in exercise intensity up to $\sim 60\%$ of maximal oxygen uptake produce elevations in CBF, after which CBF decreases toward baseline values because of lower $P_{aCO_2}$ via
hyperventilation-induced cerebral vasoconstriction. This finding indicates that, during heavy exercise, CBF decreases despite the cerebral metabolic demand. In contrast, this reduced CBF during heavy exercise lowers cerebral oxygenation and therefore may act as an independent influence on central fatigue. In this review, we highlight methodological considerations relevant for the assessment of CBF and then summarize the integrative mechanisms underlying the regulation of CBF at rest and during exercise. In addition, we examine how CBF regulation during exercise is altered by exercise training, hypoxia, and aging and suggest avenues for future research.

Sharman JE, et.al. (2005) The effect of exercise on large artery haemodynamics in healthy young men. Brachial blood pressure predicts cardiovascular outcome at rest and during exercise. However, because of pulse pressure amplification, there is a marked difference between brachial pressure and central (aortic) pressure. Although central pressure is likely to have greater clinical importance, very little data exist regarding the central haemodynamic response to exercise. The aim of the present study was to determine the central and peripheral haemodynamic response to incremental aerobic exercise. Twelve healthy men aged 31 +/- 1 years (mean +/- SEM) exercised at 50%, 60%, 70% and 80% of their maximal heart rate (HRmax) on a bicycle ergometer. Central blood pressure and estimated aortic pulse wave velocity, assessed by timing of the reflected wave (T(R)), were obtained noninvasively using pulse wave analysis. Pulse pressure amplification was defined as the ratio of peripheral to central pulse pressure and, to assess the influence of wave reflection on amplification, the ratio of peripheral pulse pressure to nonaugmented central pulse pressure (PPP : CDBP-P1) was also calculated. During exercise, there was a significant, intensity-related, increase in mean arterial pressure and heart rate (P < 0.001). There was also a significant increase in pulse pressure amplification and in PPP : CDBP-P(1) (P < 0.001), but both were independent of exercise intensity.
Estimated aortic pulse wave velocity increased during exercise (P < 0.001), indicating increased aortic stiffness. There was also a positive association between aortic pulse wave velocity and mean arterial pressure (r = 0.54; P < 0.001). Exercise significantly increases pulse pressure amplification and estimated aortic stiffness.

Saeed, S. A., et al., (2010) Exercise, yoga and meditation for depressive and anxiety disorders. Anxiety and depression are among the most common conditions cited by those seeking treatment with complementary and alternative therapies, such as exercise, meditation, tai chi, qigong, and yoga. The use of these therapies is increasing. Several studies of exercise and yoga have demonstrated therapeutic effectiveness superior to no-activity controls and comparable with established depression and anxiety treatments (e.g., cognitive behavior therapy, sertraline, and imipramine). High-energy exercise (i.e., weekly expenditure of at least 17.5 kcal per kg) and frequent aerobic exercise (i.e., at least three to five times per week) reduce symptoms of depression more than less frequent or lower-energy exercise. Mindful meditation and exercise have positive effects as adjunctive treatments for depressive disorders, although some studies show multiple methodological weaknesses. For anxiety disorders, exercise and yoga have also shown positive effects, but there are far less data on the effects of exercise on anxiety than for exercise on depression. Tai chi, qigong, and meditation have not shown effectiveness as alternative treatments for depression and anxiety.