ISSN: 2635 - 2826

Journal of Clinical & Biomedical Research

SCIENTIFIC Research and Community

Research Article

Open Access

Long-Term Effects of Effortless Exercise on Hormonal Balance and Liver Health

Xanya Sofra

City University, London, New School for Social Research, New York, USA

ABSTRACT

A previous study investigated the hypothesis that different exercise modalities including effortless exercise initiate anti-inflammatory, reparatory, and detoxification processes reinstating liver function, hormonal balance, visceral fat reduction and increased muscle mass. The current study explored the long-term results of effortless exercise on some of the same hormones previously researched such as Triiodothyronine (T3), testosterone and cortisol, as well as variables associated with optimal hepatic functioning such as albumin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyl transferase (GGT) and bilirubin.

Ten overweight individuals with an average BMI of 23.2 with an age range from 39 to 51 years old received an average of six one-hour treatments. Blood tests were taken before the first treatment and after an average of 7 months. Subjects did not comply with the clinic's nutritional recommendations. They maintained a high-caloric diet and an overall inactive lifestyle despite the clinic's warning that their habitual patterns of living would be deleterious to their health.

After an average of 7 months following AST and bilirubin remained decreased in 100% of the subjects at a statistical significance level of $p<0.0001$ and $p<0.01$ respectively. GGT remained significantly decreased ($p<0.01$) in 80% of subjects. T3 and testosterone remained significantly increased ($p<0.05$) in 60% of the subjects, while cortisol remained decreased ($p<0.01$) in 70% of the subjects. Basal Metabolic Rate (BMR) and muscle mass remained increased in 80% of subjects at $p<0.01$ and $p<0.05$ respectively. Waist circumference remained significantly decreased ($p<0.01$) in 100% of the subjects after 7 months since the first measurement.

Results of this study indicate that effortless exercise has several health benefits for the majority of individuals, irrespective of their diet and lifestyle.

***Corresponding author**

Xanya Sofra, City University, London, New School for Social Research, New York, USA.

Received: June 02, 2023; **Accepted:** July 11, 2023; **Published:** July 18, 2023

Keywords: Basal Metabolic Range, Muscle Mass, Effortless Exercise, Aerobic Exercises, Resistance Exercises, Effortless Exercise, Triiodothyronine (T3), Testosterone, Cortisol, Optimal Hepatic Functioning, Liver Health, Albumin, Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), Gamma-Glutamyl Transferase (GGT), Bilirubin, Waist Circumference Reduction

Introduction

Lasers have made a valuable contribution in cutting or removing tissue during surgery that is necessary for medical purposes, due to their minimal invasive exactness when compared to knives and the substantially enhanced wound healing after an operation [1]. Laser or RF studies on visceral fat reduction and hormonal regulation are sparse, based on animal models in the case of RF, or a combination of a specific laser technology with exercise, delivering confounding results that may not have been obtained if the subjects underwent laser procedures alone [2, 3]. Overall, targeting deeper layers of visceral fat that wrap around and penetrate vital organs with trauma-producing procedures could cause irreparable damage to vital organs.

Any type of lipolysis, including laser and RF lipolysis involves the release of toxins, including persistent organic pollutants (POS). The cooperative function of the circulatory and lymphatic systems eventually eliminates such toxins through the kidneys, liver, and immune system, but only in individuals with healthy liver and kidneys, provided that the circulatory system is not blocked by deposits of very low-density lipoproteins (VLDL), triglycerides, and the lymphatic and immune systems are not overwhelmed by excess toxicity and inflammation.

Laser and RF technologies do not directly interact with lymphatics or immunity, nor they are designed to enhance liver or kidney function. They rely entirely on the body to perform the detoxification which in turn depends on the level of erythrocyte separation. Detoxification may be significantly compromised in patients with erythrocyte aggregation and poikilocytosis that arises from excess radical oxygen species in the blood. Laser and RF marketing companies incorrectly imply without evidence, that all bodies, including unhealthy bodies, shall perform efficient detoxification after the laser of RF lipolysis [4, 5].

All exercise modalities, including effortless exercise, are vital in initiating the detoxification process that ultimately reduces inflammation and facilitates hormonal balance. Earlier research on NFLD (non-alcoholic fatty liver disease) patients demonstrated that different exercise modalities can initiate reparative processes, as adipocyte-derived mesenchymal stem cells differentiate into hepatocytes that subsequently repair the liver. In 2022, Sofra [6]. used an effortless exercise method to demonstrate a statistically significant optimization of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), C-reactive protein (CRP), triglycerides, creatinine, and bilirubin. Additionally, the study reported a statistically significant decrease in visceral fat, and cortisol and a statistically significant increase in serum testosterone, BMR and skeletal muscle mass.

The current study explored the long-term effects of effortless exercise on some of the same variables previously studied [6].

Alanine Aminotransferase (Alt)

A number of researchers [7, 8]. have postulated that ALT is usually elevated in the majority but not all individuals with liver disease. According to a study of 222 individuals, 23% of the subjects had normal ALT [9]. ALT is an enzyme primarily found in the liver, also known as serum glutamic-pyruvic transaminase (SGPT). It often produces jaundice (yellow skin or eyes), nausea, fatigue, light-coloured stool and dark-coloured urine.

Aspartate Aminotransferase (AST)

Two clinical trials on a total of 645 subjects reveal that AST is a reliable predictor of fatty liver disease [10, 11]. Patients with elevated levels of AST present similar symptoms as those observed in individuals with increased ALT values, which include jaundice, nausea, fatigue, swollen belly, swelling of the ankles, bruises, etc.

Elevated Cortisol Undermining Health Status

Elevated cortisol levels have also been associated with liver dysfunction in some studies but not others [12, 13]. Elevated cortisol is negatively correlated with overall health status, and has been associated with a number of medical conditions [14]. High cortisol induces a number of clinical disorders including infections, depression and premature aging [15]. Excess cortisol has been correlated with cognitive decline, neurodegeneration and Alzheimer's disease [16]. Elevated cortisol levels manifested in Cushing's disease appear to interfere with verbal learning, memory, and visual-spatial ability [17].

Albumin

Albumin is a plasma protein that regulates colloid osmotic pressure which increases as a result of erythrocyte aggregation. Albumin is crucial in transporting thyroxine, bilirubin, and L-tryptophan which has anti-depressant abilities due to being transformed into serotonin, nitric oxide (a gas that increases blood flow by relaxing the vessels) and free fatty acids. Albumin is a core component of pharmacokinetic and toxicokinetic processes, binding to almost all known drugs including halothane anaesthetics. [18, 19].

Gamma-glutamyl Transferase (GGT)

GGT has been traditionally used to assess fatty liver disease and hepatic inflammation. According to recent research, GGT has been associated with 18% of cardiovascular disorders and has been highly correlated with the risk of coronary heart disease, type 2 diabetes and stroke. Importantly, individuals who generally appear healthy may have high GGT levels, a sign that should be seriously evaluated to prevent an inconspicuous medical condition from insidiously developing underneath the false front of normality [20, 21].

Testosterone

This is a hormone involved in a number of vital functions including healthy libido that can positively affect mood, bone and muscle mass increase, glycolysis, and cholesterol metabolism. Testosterone serves as a protective mechanism against several medical conditions, such as insulin resistance, type 2 diabetes, metabolic syndrome, osteoporosis and cardiovascular disease [22, 23].

The Results of Exercise

Research has provided both internal and external validity to studies reporting the positive effects of exercise on overall health. [24-26]. Several research studies that have used an effortless exercise technology, originally invented at London University, have reported optimal levels of creatinine, bilirubin, C-reactive protein (CRP), cortisol, VLDL (very low-density lipoprotein), HDL (high-density lipoprotein), glucose, insulin, and triglycerides. This line of research has also demonstrated a significant decrease in visceral and subcutaneous fat, and a within-normal-range increase of testosterone, free triiodothyronine (T3), the active part of the thyroid hormone, growth hormones, and a balanced profile of leptin and ghrelin that is necessary to stabilize appetite and eliminate cravings, thus avoiding weight gain rebound [27-30].

How Effortless Exercise Works

The treatment sends a motor nerve blueprint signal that was developed and upgraded over a period of 47 years, originally invented at London University. This resonates with the nervous system, exciting the sensory nerves which carry the signal to the brain, triggering the secretion of hormones that naturally release the fat contents into the bloodstream which include endogenous stem cells. Simultaneously, the brain synchronizes the motor nerves to induce a full-body coordinated contraction that is experienced as the complex strenuous workout performed in a gym. This process is fundamentally different from electrostimulation which directly depolarizes small clusters of muscle cells, without involving the central nervous system and without causing a full-body coordinated muscle contraction as it happens during regular exercise.

Methodology

Ten overweight Malaysian individuals with an average BMI of 23.2 with an age range from 39 to 51 years received an average of six, one-hour treatments. Blood tests were taken before the first treatment and after an average of 7 months. The BMR, and muscle mass increase were determined by a conductance scale. Waist circumference was documented by a measuring tape.

Subjects who consented to participate in the study were treated by the same doctor who had no personal interest in the direction of the results. Blood tests were administered by a professional who was trained in that area and who had no interest in the direction of the results. Subjects that were included in the study did not report any medical or mental disorders during their intake interview.

All subjects were given a food intake questionnaire to monitor their eating habits and lifestyle. Subjects did not comply with the clinic's nutritional recommendations. They maintained a high-caloric diet and an overall inactive lifestyle despite the clinic's warning that negative habitual patterns would be deleterious to their health.

This clinical trial was based on a small sample. However, it is rather unlikely that selection bias posed a threat to internal validity since neither the author nor the doctors and technicians were involved in subject selection. Subjects' participation depended entirely on the subjects' willingness to finance their treatments and blood test, as well as consent to being included in the research.

Variables measured

1. Serum Triiodothyronine (T3)
2. Serum Testosterone
3. Serum Cortisol
4. Albumin
5. Serum aspartate aminotransferase (AST)
6. Serum alanine aminotransferase (ALT)
7. Serum Gamma-glutamyl Transferase (GGT)
8. Serum Bilirubin
9. Basal Metabolic Rate (BMR)
10. Muscle Mass (MM)
11. Waist Circumference

Results

T-tests statistical analyses unveiled the following results:

Triiodothyronine (T3)

After an average of seven months following 6 one-hour effortless exercise treatments, Triiodothyronine (T3) was significantly increased by 12% in 60% of the subjects at the $p<0.05$ statistical significance level.

T3 pmol/L. Normal Range 2-7 pmol/L

Mean: 0.39
μ = 0
S2 = SS/df = 1.01/(7-1) = 0.17
S2M = S2/N = 0.17/7 = 0.02
SM = √S2M = √0.02 = 0.15

t = (M - μ)/SM = (0.39 - 0)/0.15 = 2.49

The value of t is 2.48907. The value of p is .04722. The result is significant at p <0.05.

Testosterone

After an average of seven months following 6 one-hour effortless exercise treatments, testosterone remained significantly increased at the $p>0.1$ level of statistical significance in 60% of the subjects.. Testosterone increased by 37.9% in the female subjects and 166.3% in the male subject.

Testosterone: Normal Range Females: 0.5-2.4 nmol/L. Males: 10-35 nmol/L

Difference Scores Calculations

Mean:0.22
μ =0
S2 = SS/df =0.11/(5-1)=0.03
S2M = S2/N =0.03/5=0.01
SM = √S2M = √0.01 = 0.07

T-Value Calculation
t =(M - μ)/SM =(0.22-0)/0.07=2.99

The value of t is 2.993821. The value of p is .04019. The result is significant at p <0.10.

Cortisol

After an average of seven months following an average of 6 one-hour effortless exercise treatments, Cortisol remained significantly decreased at the $p>0.01$ level of statistical significance indicating a 7% stress reduction in seven out of 10 subjects (70%). Cortisol was below the normal range in 10% of the subjects and was optimally elevated to remain within the normal range seven months after the first treatment.

Cortisol taken only during the AM: Normal Range 140-690-nmol/L.
Difference Scores Calculations

Mean: -22.29
μ = 0
$S^2 = SS/df = 657.43/(7-1) = 109.57$
$S^2_M = S^2/N = 109.57/7 = 15.65$
$S_M = \sqrt{S^2_M} = \sqrt{15.65} = 3.96$

T-value Calculation

$t = (M - \mu)/S_M = (-1.67 - 0)/0.44 = -3.78$

The value of t is -5.632834. The value of p is .00134. The result is significant at p < 0.01.

Albumin

After an average of seven months following 6 one-hour effortless exercise treatments, Albumin remained significantly increased in 30% of the subjects. This number of subjects was too small to calculate the significance value. 70% of subjects showed no significant increase in albumin after seven months. However, the albumin values in 70% of individuals were already optimally elevated so further elevation could push albumin above the normal range.

Albumin Normal Range: 34-54 G/L

Aspartate Aminotransferase (AST)

After an average of seven months following 6 one-hour effortless exercise treatments, Aspartate Aminotransferase (AST) remained significantly decreased by -18% in 100% of the subjects at the $p<0.0001$ statistical significance level.

Aspartate Aminotransferase (AST): Normal Range: Males 14-20 U/L Females 10-36 U/L

Difference Scores Calculations

Mean: -1.89
$\mu = 0$
$S^2 = SS/df = 4.89/(9-1) = 0.61$
$S^2M = S^2/N = 0.61/9 = 0.07$
$S_M = \sqrt{S^2_M} = \sqrt{0.07} = 0.26$

T-value Calculation

$t = (M - \mu)/S_M = (-1.89 - 0)/0.26 = -7.25$

The value of t is -7.248824. The value of p is .00009. The result is significant at p<0.0001.

Alanine Aminotransferase (ALT)
After an average of seven months following an average of 6 one-hour effortless exercise treatments, Alanine Aminotransferase (ALT) remained significantly decreased by -23% in 40% of the subjects with elevated ALT. 40% of the subjects with ALT below the normal range had an optimal decrease of ALT of 35%. Both samples were too small to calculate statistical significance. 20% of the subjects did not show any health benefits related to ALT

Alanine Aminotransferase (ALT) Normal Range: Males 19-25 U/L Females 29-33 U/L

Gamma-glutamyl Transferase (GGT)
After an average of seven months following 6 one-hour effortless exercise treatments, Gamma-glutamyl Transferase (GGT) remained significantly decreased by -10.4% in eight out of 10 subjects (80%) subjects at the p<0.01 statistical significance level. 10% of the subjects had GGT values below the normal range and the GGT was optimally elevated to be within the normal range. However, this sample was too small for performing a statistical analysis.

Gamma-glutamyl Transferase (GGT): Normal Range: Males 14-20 U/L Females 10-36 U/L

Difference Scores Calculations

Mean: -1.12
$\mu = 0$
$S^2 = SS/df = 2.88/(8-1) = 0.41$
$S^2_M = S^2/N = 0.41/8 = 0.05$
$S_M = \sqrt{S^2_M} = \sqrt{0.05} = 0.23$

T-value Calculation

$t = (M - \mu)/S_M = (-1.12 - 0)/0.23 = -4.97$

The value of t is -4.965096. The value of p is .00163. The result is significant at p < 0.01.

Bilirubin
After an average of seven months following 6 one-hour effortless exercise treatments, Bilirubin remained significantly decreased in 100% of the subjects at the p<0.01 statistical significance level.

Bilirubin: Normal Range: Males 14-20 U/L Females 10-36 U/L

Difference Scores Calculations

Mean: -1.67
$\mu = 0$
$S^2 = SS/df = 14/(9-1) = 1.75$
$S^2_M = S^2/N = 1.75/9 = 0.19$
$S_M = \sqrt{S^2_M} = \sqrt{0.19} = 0.44$

T-value Calculation

$t = (M - \mu)/S_M = (-1.67 - 0)/0.44 = -3.78$

The value of t is -3.779645. The value of p is .00539. The result is significant at p < 0.01.

Basal Metabolic Rate (BMR)
After an average of seven months following 6 one-hour effortless exercise treatments, Basal Metabolic Rate (BMR) remained significantly increased in 80% of the subject at the p<0.01 level of statistical significance.

Difference Scores Calculations

Mean: 46
$\mu = 0$
$S^2 = SS/df = 8914/(8-1) = 1273.43$
$S^2_M = S^2/N = 1273.43/8 = 159.18$
$S_M = \sqrt{S^2M} = \sqrt{159.18} = 12.62$

T-value Calculation

$t = (M - \mu)/S_M = (46 - 0)/12.62 = 3.65$

The value of t is 3.64599. The value of p is .00822. The result is significant at p < 0.01.

Waist Circumference
After an average of seven months following 6 one-hour effortless exercise treatments, Waist Circumference remained significantly decreased in 100% of the subject at the p<0.01 level of statistical significance

Difference Scores Calculations

Mean: -1.55
$\mu = 0$
$S^2 = SS/df = 17.23/(10-1) = 1.91$
$S^2M = S^2/N = 1.91/10 = 0.19$
$S_M = \sqrt{S^2_M} = \sqrt{0.19} = 0.44$

T-value Calculation

$t = (M - \mu)/S_M = (-1.55 - 0)/0.44 = -3.54$

The value of t is -3.543018. The value of p is .00628. The result is significant at p < 0.01.

Muscle Mass
After an average of seven months following 6 one-hour effortless exercise treatments, Muscle Mass remained significantly Increased in 80% of the subject at the p<0.05 level of statistical significance.

Difference Scores Calculations

Mean: 1.3
$\mu = 0$
$S^2 = SS/df = 10.42/(7-1) = 1.74$
$S^2M = S^2/N = 1.74/7 = 0.25$
$S_M = \sqrt{S^2M} = \sqrt{0.25} = 0.5$

T-value Calculation

$t = (M - \mu)/S_M = (1.3 - 0)/0.5 = 2.61$

The value of t is 2.609962. The value of p is .02006. The result is significant at p < 0.05.

Discussion

Lifestyle is a crucial aspect of health maintenance. Our subjects did not follow nutritional recommendations and were non-compliant with lifestyle changes. Still, after only six sessions of effortless exercise, the majority of subjects had long-term health benefits that lasted for seven months after treatments were initiated. There was a statistically significant increase in BMR and muscle mass in 80% of the subjects. Presumably, results were compromised in 20% of the subjects due to their high-caloric diet and inactive habitual patterns of living.

Sixty per cent (60%) of the subjects showed significant health benefits in terms of T3 and testosterone. Importantly, the level of testosterone increases in 60% of the subjects was quite robust, with females showing a 37.9% increase and males demonstrating a 166.3% testosterone increase that was maintained for seven months after the onset of treatments. On the other hand, 40% of the subjects did not present any optimal fluctuations in T3 and testosterone. Possibly, eating habits and inactivity have a greater effect on T3 and testosterone. An unhealthy lifestyle accelerates ageing [31]. by increasing metabolic age to be higher than chronological age.

One of the most important aspects of blood analysis is paying attention to whether results unfold towards two opposite directions, some being above the normal range and others being below the normal range. Health is signified by results that are within the normal range. Results above or below the normal range are pathological. In our sample, 40% of the subjects with high ALT showed an optimal ALT decrease after the 6 treatments. 40% of subjects with low ALT that was below or at the borderline of the normal range, exhibited an increase in ALT. In other words, a total of 80% of subjects gained a health benefit as a result of the 6 effortless exercise sessions. ALT was optimized in 80% of the subjects – a percentage that combined 40% of subjects with high ALT that manifested a significant ALT decrease, and 40% of subjects with low ALT that demonstrated an ALT increase after the six treatments. As previously noted, increased ALT blood levels indicate liver disease. On the other hand, low ALT levels are correlated with frailty and an increased risk of mortality [32].

A total of 80% of the subjects showed health benefits related to cortisol. Cortisol was decreased in 70% of the subjects with high cortisol and increased in 10% of the subjects whose cortisol was below the normal range. High cortisol is associated with Cushing's disease, while low cortisol is correlated with a hypothalamic-pituitary-adrenal deficit reflected in fibromyalgia and Addison's disease [33, 34].

GGT had a similar pattern of results with 80% of the subject having a statistically significant long-term decrease in their GGT levels and 10% of subjects whose GGT was below the normal range getting a long-term increase, totalling 90% of the subjects that had a longterm health benefit in this variable.

AST and Bilirubin remained consistently reduced in 100% of the subjects, seven months after initiating treatments at a high level of statistical significance of $p<0.001$ and $p<0.01$ respectively. AST and bilirubin presented the most robust consistent effects of effortless exercise on this particular population

Conclusion

The results of this longitudinal study supported the findings of previous short-term studies that used the same effortless exercise modality, verifying the hypothesis that effortless exercise has lasting health benefits for the majority of individuals despite their non-compliance with nutritional recommendations and optimal lifestyle changes. It should be noted that the sample size was small and more research is warranted with larger samples from different ethnicities. Additionally, it would be interesting to compare and contrast the results of individuals who are compliant with nutritional and lifestyle recommendations with those who are not, like the subjects in the current study, to better assess the importance of nutrition and lifestyle on health status.

Acknowledgement

The author would like to thank Dr Maxx and Dr Chua at the Suisse Clinic in Kuala Lumpur, Malaysia for providing the patient data included in this study.

Conflict of Interest

The author declares no conflict of interest. All treatments were performed by operators without the direct presence or hands-on supervision of the author.

Funding

No funding was received by a third party or institution.

References

1. Khalkhal E, Rezaei-Tavirani M, Zali MR, Akbari Z (2019) The evaluation of laser application in surgery: a review article. Journal of lasers in medical sciences 10: S104-S111.
2. Skoluda N, Dettenborn L, Stalder T, Kirschbaum C (2012) Elevated Hair Cortisol Concentrations in Endurance Athletes. Psychoneuroendocrinology 37: 611-617.
3. Hill EE, Zack E, Battaglini C, Viru M, Viru A, et al. (2008) Exercise and Circulating Cortisol Levels: The Intensity Threshold Effect. Journal of Endocrinological Investigation 31: 587-591.
4. Balaratnam S (2017) Evolution of laser lipolysis in non-invasive fat reduction and body sculpting. Journal of Aesthetic Nursing 6: 466-471.
5. Thomson H (2010) Lose inches off your waist in minutes. New Scientist 205: 42-45.
6. Sofra X (2022) Liver repair of NAFLD patients following effortless exercise and the possible involvement of endogenous stem cells https://medcraveonline.com/JDMDC/JDMDC-09-00235.pdf.
7. Kim WR, Flamm SL, Di Bisceglie AM, Bodenheimer HC (2008) Public Policy Committee of the American Association for the Study of Liver Disease. Serum activity of alanine aminotransferase (ALT) as an indicator of health and disease. HEPATOLOGY-BALTIMORE THEN ORLANDO 47: 1527-3350
8. Wedemeyer H, Hofmann WP, Lueth S, Malinski P, Thimme R, et al. (2010) ALT screening for chronic liver diseases: scrutinizing the evidence. Zeitschrift fur Gastroenterologie 48: 46-55.
9. Verma S, Jensen D, Hart J, Mohanty SR (2013) Predictive value of ALT levels for non-alcoholic steatohepatitis (NASH) and advanced fibrosis in non-alcoholic fatty liver disease (NAFLD). Liver International 33: 1398-1405.
10. Abangah G, Yousefi A, Asadollahi R, Veisani Y, Rahimifar P, et al. (2014) Correlation of body mass index and serum parameters with ultrasonographic grade of fatty change in non-alcoholic fatty liver disease. Iranian Red Crescent Medical Journal 16: e12669.
11. Hossain N, Afendy A, Stepanova M, Nader F, Srishord M, et

al. (2009) Independent predictors of fibrosis in patients with nonalcoholic fatty liver disease. Clinical Gastroenterology and Hepatology 7: 1224-1229.
12. Targher G, Bertolini L, Rodella S, Zoppini G, Zenari L, et al. (2006) Associations between liver histology and cortisol secretion in subjects with nonalcoholic fatty liver disease. Clinical endocrinology 64: 337-341.
13. Ahmed A, Rabbitt E, Brady T, Brown C, Guest P, et al. (2012) A switch in hepatic cortisol metabolism across the spectrum of non-alcoholic fatty liver disease. PloS one 7: e29531.
14. Hubel JM, Schmidt SA, Mason RA, Haenle MM, Oeztuerk S, et al. (2015) Influence of plasma cortisol and other laboratory parameters on nonalcoholic Fatty liver disease. Hormone and Metabolic Research 47: 479-484.
15. Sapse AT (1997) Cortisol, high cortisol diseases and anti-cortisol therapy. Psychoneuroendocrinology 22: S3-S10.
16. Ouanes S, Popp J (2019). High cortisol and the risk of dementia and Alzheimer's disease: a review of the literature. Frontiers in aging neuroscience 11: 43.
17. Starkman MN, Giordani B, Berent S, Schork MA, Schteingart DE (2001) Elevated cortisol levels in Cushing's disease are associated with cognitive decrements. Psychosomatic medicine 63: 985-993.
18. Ha CE, Bhagavan NV (2013) Novel insights into the pleiotropic effects of human serum albumin in health and disease. Biochimica et Biophysica Acta (BBA)-General Subjects 830: 5486-5493.
19. Belinskaia DA, Voronina PA, Shmurak VI, Jenkins RO, Goncharov NV (2021) Serum albumin in health and disease: esterase, antioxidant, transporting and signaling properties. International journal of molecular sciences 22: 10318.
20. Whitfield JB (2001) Gamma glutamyl transferase. Critical reviews in clinical laboratory sciences 38: 263-355.
21. Mason JE, Starke RD, Van Kirk JE (2010) Gamma-Glutamyl transferase: a novel cardiovascular risk BioMarker. Preventive cardiology 13: 36-41.
22. Kelly DM, Jones TH (2013) Testosterone: a metabolic hormone in health and disease. Journal of Endocrinology 217: R25-R45.
23. Mohamad NV, Soelaiman IN, Chin KY (2016) A concise review of testosterone and bone health. Clinical interventions in aging 11: 1317-1324.
24. Hashida R, Kawaguchi T, Bekki M, Omoto M, Matsuse H, et al. (2017) Aerobic vs. resistance exercise in non-alcoholic fatty liver disease: A systematic review. Journal of hepatology 66: 142-152.
25. Aamann L, Dam G, Rinnov AR, Vilstrup H, Gluud LL (2018) Physical exercise for people with cirrhosis. Cochrane Database of Systematic Reviews 12.
26. Romero-Gómez M, Zelber-Sagi S, Trenell M (2017) Treatment of NAFLD with diet, physical activity and exercise. Journal of hepatology 67: 829-846.
27. Sofra X, Badami S (2020) A Review of COVID-19 associated factors: CRP, Creatinine, Bilirubin, VLDL, HDL, Triglycerides, Cortisol and Thyroid Function. J Endo Metabol Res 1: 1-17.
28. Sofra X, Badami S (2020) Adverse effects of sedentary lifestyles: Inflammation, and high-glucose induced oxidative stress-A double-blind randomized clinical trial on diabetic and prediabetic patients. Health 12: 1029-1048.
29. Sofra X (2020) The Importance of Systemic Balance in Safeguarding Health: A Randomized Double-Blind Clinical Trial on VLDL, Triglycerides, Free T3, Leptin, Ghrelin, Cortisol and Visceral Adipose Tissue. Health 12: 1067-1084.
30. Sofra X (2020) How to get rid of visceral fat: a randomised double-blind clinical trial. Journal of Aesthetic Nursing 9: 268-275.
31. Travison TG, Araujo AB, Kupelian V, O'Donnell AB, McKinlay JB (2007) The relative contributions of aging, health, and lifestyle factors to serum testosterone decline in men. The Journal of Clinical Endocrinology & Metabolism 92: 549-555.
32. Ramaty E, Maor E, Peltz-Sinvani N, Brom A, Grinfeld A, et al. (2014) Low ALT blood levels predict long-term all-cause mortality among adults. A historical prospective cohort study. European journal of internal medicine 25: 919-921.
33. Izquierdo–Álvarez S, Bocos–Terraz JP, Bancalero–Flores JL, Pavón–Romero L, Serrano-Ostariz E, et al. (2008) Is there an association between fibromyalgia and below-normal levels of urinary cortisol? BMC Research Notes 1: 1-4.
34. Saverino S, Falorni A (2020) Autoimmune Addison's disease. Best Practice & Research Clinical Endocrinology & Metabolism 34: 101379.