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Research Article

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A summarized Report of Five Research Reports Regarding Visceral Fat Ratio and its Various Related Factors Using Viscoplastic Energy Model of GH-Method: Math-Physical Medicine (No. 998, VMT #396, 12/15/2023)

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Abstract
This article presents a summarized report of five individual analyses conducted by the author on visceral fat ratio (VFR) and its related factors:
- *Study 993: Food intake (in grams) vs. VFR, MHR, BMI.*
- *Study 994: Daily walking steps vs. VFR, MHR, BMI.*
- *Study 995: VFR's impact on Type 2 Diabetes (T2D), food portion, food quality, walking steps, and sleep score.*
- *Study 996: VFR's relation to obesity, T2D, hypertension, and dyslipidemia.*
- *Study 997: VFR's connection to Cardiovascular Disease (CVD), Chronic Kidney Disease (CKD), cancer, Alzheimer's disease (AD), and Parkinson's disease (PD).*

Background
Visceral Fat (VF) is the underlying culprit for cardiovascular diseases, type2 diabetes, breast cancer, etc. VF can be estimated at present only by using expensive instruments as Bio Impedance Analyzer (BIA), DEXA scanner, etc. Measurement of Waist-Hip Ratio (WHR) can be used as a proxy for VF. Hence, the present study was done to assess the role of WHR as appropriate technology for assessment of VF. The aim of this study was to find correlation of Visceral Fat Area (VFA) with (WHR), Waist Circumference (WC) and Body Mass Index (BMI) in young healthy adults.

Methods
It was a descriptive cross-sectional study conducted on 215 healthy adults over one year in Western Maharashtra. Biospace 720 was used to assess VF. Data was analyzed by using software SPSS version 20.0. In body 720 was used to assess VF of subjects.

Results
Majority 155 (73%) were males and 57 (27%) were females. Nearly half (42% of males, 49% of females) had VFA above cut off value (i.e. 100 cm2) and 42% of males had WHR >0.9 and 56% of females had WHR >0.8. We found a very strong correlation between VFA and WHR ($r = 0.936$, $p < 0.05$) among males and females ($r = 0.920$, $p < 0.05$) and correlation between WC and BMI with VFA ($r = 0.739$, $r = 0.758$) for males, ($r = 0.774$, $r = 0.605$) for females was modest.

Conclusion
There is a strong correlation between VF and WHR. Measurement of WHR is simple, handy, and inexpensive tool which can be used as a surrogate to measure VF."

In summary, *the author utilized the space-domain viscoplastic medicine energy theory (SD-VMT) to explore dynamic interactions between annual VFR and other inter-related factors over 11 years. The summarized findings, based on SD-VMT energies, are:*

For food portion versus 3factor:

VFR (41%) > BMI (31%) > WHR (28%) & Total diet energy =247

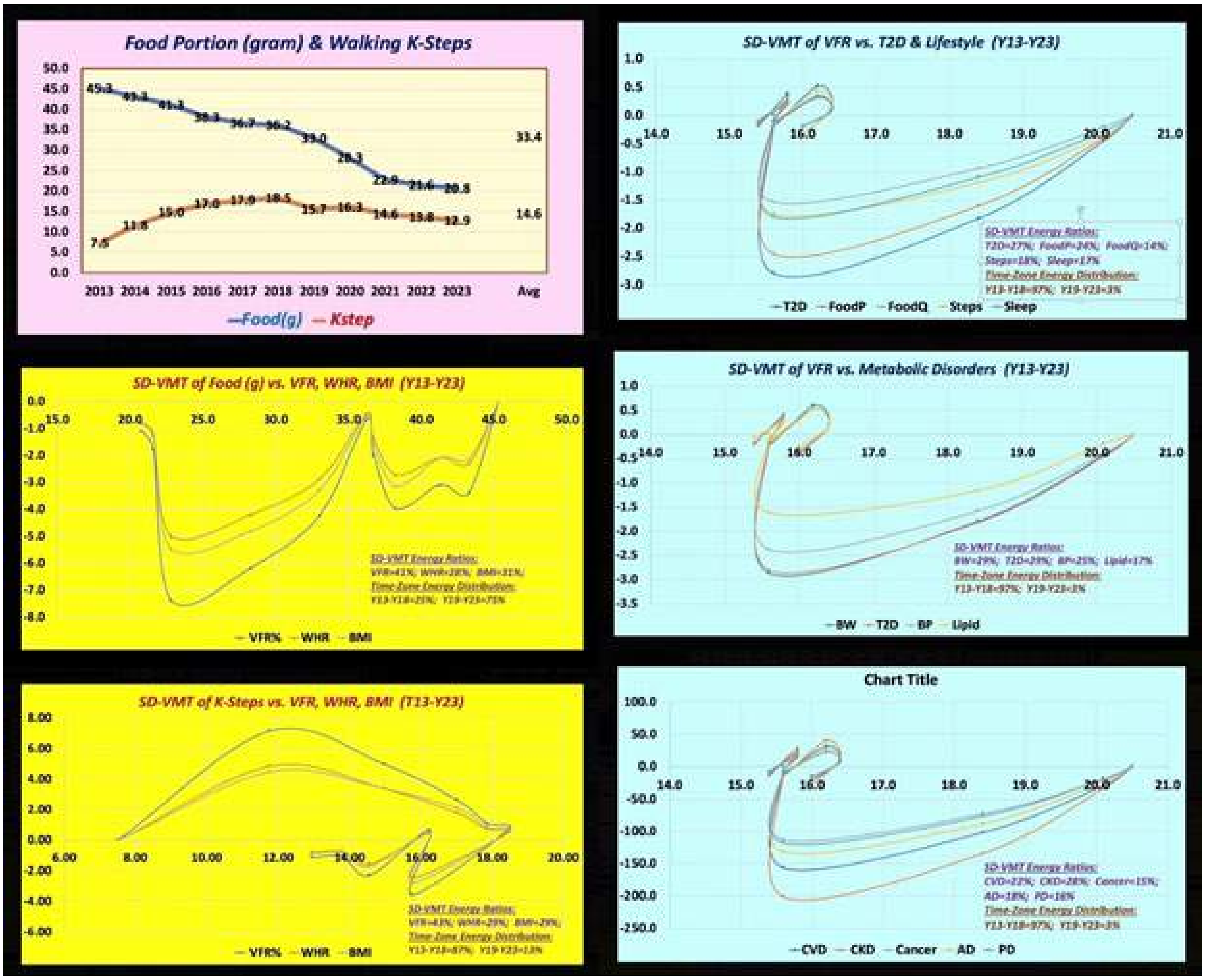
For walking k-steps versus 3 factors:
VFR (43%) > BMI (29%) = WHR (29%) & Total exercise energy = 121
Note: The ratio of diet energy to exercise energy is 2.04 (247/121)

For VFR versus 5 lifestyle factors:
T2D (37%) > Food Portion (24%) > Steps (18%) > Sleep (17%) > Food Quality (14%)

For VFR versus 4 metabolic disorder factors: ***Obesity (29%) = Type 2 Diabetes (39%) > Hypertension (25%) > Dyslipidemia (27%)***

For VFR versus 5 mortality diseases:
CKD (28%) > CVD (22%) > AD (18%) > PD (16%) > Cancers (15%)

Key Message
Effective overweight ad obesity management, crucial in preventing T2D, can be achieved through a consistent exercise regime and a portion-controlled diet. Diet control, which includes both portion and quality, is more effective than exercise alone, with a diet-toexercise importance ratio of 2.04. Eliminating visceral fat is challenging and requires effective exercise strategies, persistence, and patience. Metabolic conditions like hypertension and dyslipidemia often accompany or result from diabetes. Overweight or obesity can lead to metabolic disorders, increasing the risk of severe diseases like CVD, CKD, various cancers, and dementia. Study No. 997 uses the author's personal data and experiences to demonstrate a research methodology for assessing health risks associated with these mortality diseases, providing insights for others to evaluate their own health risks.



1. Introduction

This article presents a summarized report of five individual analyses conducted by the author on visceral fat ratio (VFR) and its related factors:

- Study 993: Food intake (in grams) vs. VFR, MHR, BMI.
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- Study 995: VFR's impact on Type 2 Diabetes (T2D), food portion, food quality, walking steps, and sleep score.
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- Study 997: VFR's connection to Cardiovascular Disease (CVD), Chronic Kidney Disease (CKD), cancer, Alzheimer's disease (AD), and Parkinson's disease (PD).

2. Biomedical Information

The following sections contain excerpts and concise information drawn from multiple medical articles, which have been meticulously reviewed by the author of this paper. The author has adopted this approach as an alternative to including a conventional reference list at the end of this document, with the intention of optimizing his valuable research time. It is essential to clarify that these sections do not constitute part of the author's original contribution but have been included to aid the author in his future reviews and offer valuable insights to other readers with an interest in these subjects.

3. Visceral Fat Ratio

The normal healthy range for visceral fat levels can vary depending on factors such as age, gender, and overall body composition. However, ***a general guideline is that a visceral fat level of 1-12 on a scale of 1-59 (measured by a CT or MRI scan) is considered within a healthy range for adults.*** It is important to note that these ranges can differ between individuals, so it is advisable to consult with a healthcare professional for personalized recommendations based on your specific health and fitness goals. ***A visceral fat rate of 20% is considered high and can be an indicator of increased health risks. Visceral fat, also known as belly fat, is located deep within the abdominal cavity and is associated with a higher risk of developing heart disease, type 2 diabetes, certain cancers and other health issues.*** It is generally recommended to maintain a lower level of visceral fat for optimal health. ***The normal healthy range of visceral fat for a 70-year-old male can vary, but generally, a visceral fat area (VFA) of less than 100 cm² is considered healthy.*** VFA is commonly measured using imaging techniques such as CT scans or MRI scans. However, it is essential to keep in mind that individual health circumstances and body composition can influence what may be considered a healthy range for visceral fat.

4. Pathophysiologically, What Diseases are Related to High Visceral Fat?

High levels of visceral fat have been linked to an increased risk of several diseases and health conditions, including:

- ***Cardiovascular Disease:*** Excess visceral fat has been associated with an elevated risk of developing heart disease, including atherosclerosis, heart attacks, and stroke.
- ***Type 2 Diabetes:*** Studies have shown a strong correlation between high visceral fat levels and insulin resistance, a key factor in the development of type 2 diabetes.
- ***Metabolic Syndrome:*** *Visceral fat accumulation is a central component of metabolic syndrome, a cluster of conditions that includes high blood pressure, high blood sugar, abnormal cholesterol levels, and increased waist circumference, leading to an increased risk of heart disease, stroke, and diabetes.*
- **Certain Cancers:** Research has indicated that high levels of visceral fat are linked to an increased risk of developing certain types of cancers, including ***colorectal cancer and breast cancer.***
- **Liver Disease:** Visceral fat is associated with ***non-alcoholic fatty liver disease (NAFLD)***, a condition characterized by an accumulation of fat in the liver, which can lead to inflammation and liver damage. Furthermore, ***non-alcoholic fatty liver disease (NAFLD)*** can potentially lead to the development of liver cancer. Over time, longstanding NAFLD can progress to more severe liver conditions, such as ***non-alcoholic steatohepatitis (NASH),*** which is characterized by inflammation and liver cell damage. ***In some cases, NASH can further progress to liver fibrosis, cirrhosis, and eventually, hepatocellular carcinoma (HCC), which is the most common type of primary liver cancer.***

The exact mechanisms by which NAFLD progresses to liver cancer are complex and still being studied, but ***it is well-established that individuals with advanced NAFLD, particularly those with NASH and cirrhosis, have an increased risk of developing liver cancer.*** Therefore, it is important for individuals with NAFLD, especially those with advanced stages of the disease, to undergo regular monitoring and receive appropriate medical care to mitigate the risk of liver cancer and other serious complications.

- ***Sleep Apnea:*** Excessive visceral fat has been correlated with an increased likelihood of developing sleep apnea, a sleep disorder marked by disrupted breathing patterns during sleep.
- ***Overall Mortality:*** High levels of visceral fat have been linked to a higher risk of premature death from various causes, making it a significant risk factor for overall mortality.

It is important to note that the relationship between visceral fat and these conditions is complex and can be influenced by genetic, lifestyle, and environmental factors. This underscores the significance of maintaining a healthy body composition and lifestyle for minimizing the risk of these diseases associated with excessive visceral fat.

5. Other Information Regarding Visceral Fat

Visceral fat, often referred to as "deep" fat, is stored within the abdominal cavity and surrounds important internal organs like the liver, pancreas, and intestines. A healthy visceral fat ratio is crucial for overall health. The visceral fat ratio is usually measured as part of the body fat percentage, but specific healthy ranges can vary based on the method of measurement. Generally, a lower visceral fat level is better for health. Here are some general guidelines:

- **Using Bioelectrical Impedance Analysis (BIA):** Many modern body composition scales use this method. They often rate visceral fat on a scale from 1 to 59. A rating of 1-12 is considered healthy, 13-59 indicates an unhealthy level.
- **Using CT or MRI Scans:** These are more accurate but also more expensive and less commonly used. Doctors may give

a specific range in square centimeters or inches, but there's no widely agreed-upon "healthy" range in the general population.

• **General Guidelines:** As there's no standard universal measurement for a healthy visceral fat level, it's often recommended to maintain a healthy overall body fat percentage and waist circumference. ***For men, a waist circumference below 40 inches and for women, below 35 inches is often recommended.***

• **Age and Gender Factors:** The healthy range can vary based on age and gender. It's important to consult with a healthcare professional for personalized advice.Remember, reducing visceral fat through a healthy diet, regular physical activity, and maintaining a healthy weight can significantly improve overall health. It's always best to consult with a healthcare provider for personalized advice. A healthy range for visceral fat ratio varies based on various factors such as age, gender, and overall health.

Typically, a visceral fat rating of:

• 1 to 12 is considered healthy.

• 13 to 59 is high and may increase health risks.

• Above 59 is considered very high and indicates a much higher risk of health issues.

However, it's important to note that these numbers can vary based on the method of measurement and the specific criteria used by different health organizations or devices. It's always best to consult with a healthcare professional for personalized advice and assessment. The relationship between body weight and visceral fat ratio is a key aspect of understanding overall health and obesity-related risks. ***Visceral fat, also known as intraabdominal fat, is the fat that surrounds internal organs. Unlike subcutaneous fat, which is located under the skin, visceral fat is more closely linked to various health issues.***

• ***Body Weight and Fat Distribution:*** While body weight gives an overall indication of health status, it doesn't differentiate between muscle, bone, water, and fat content. *Two people with the same body weight might have vastly different visceral fat ratios.*

• ***Health Risks of High Visceral Fat:*** High levels of visceral fat are associated with increased risks of several health conditions, including type 2 diabetes, heart disease, and certain cancers. This is because ***visceral fat releases proinflammatory substances that can affect body metabolism and insulin sensitivity.***

• ***Measurement Techniques:*** Visceral fat can be measured through imaging techniques like CT scans or MRIs. Simpler methods like waist circumference and waist-to-hip ratio can also provide an indication of visceral fat levels.

• ***Impact of Diet and Exercise:*** A healthy diet and regular exercise can help reduce visceral fat. *Even without a significant change in body weight, reducing visceral fat can greatly improve health outcomes.*

• ***Genetic and Lifestyle Factors:*** Genetic predisposition can affect where the body stores fat. Lifestyle factors, including diet, physical activity, and stress levels, also play a crucial role in determining visceral fat accumulation.

In summary, while body weight is an important health indicator, the ratio of visceral fat provides a more detailed understanding of health risks associated with obesity. Reducing visceral fat through lifestyle changes can significantly improve health, even without drastic changes in body weight. *The numerical relationship between waistline and visceral fat ratio is not straightforward, as it involves various factors and can differ significantly from person to person*. However, some general principles can be outlined:

• **Waist Circumference as an Indicator:** A larger waist circumference often indicates a higher amount of visceral fat, as visceral fat accumulates around the abdominal area.

• **Body Composition Factors:** The relationship also depends on overall body composition, including muscle mass and subcutaneous fat (fat under the skin). Two individuals with the same waist circumference may have different visceral fat ratios due to these factors.

• **Gender and Age Differences:** *Men typically have a higher propensity to accumulate visceral fat compared to women.* Age also plays a role, with the tendency to gain visceral fat increasing as one gets older.

• **Health Guidelines:** Health organizations often provide guidelines for waist circumference that are linked to health risks associated with visceral fat. For example, a ***waist circumference above 40 inches (102 cm) for men and 35 inches (88 cm) for women is often considered a risk factor for cardiovascular diseases and type 2 diabetes.***

• **Individual Variability:** It's important to note that individual genetic, lifestyle, and health factors can significantly influence this relationship.For precise assessment and personalized advice, it's recommended to consult with healthcare professionals who can measure visceral fat using specific medical imaging techniques and provide guidance based on individual health profiles.The visceral fat ratio, often measured as a part of body composition analysis, is a crucial indicator of health. Different numerical ranges for the visceral fat ratio indicate varying health statuses:

• **Healthy Range:** A visceral fat level of 1-12 is generally considered healthy. This range indicates a lower risk of health issues related to visceral fat.

• **Elevated Risk Range:** Levels from 13 to 59 signify an elevated risk. While not immediate cause for alarm, it's a sign to watch dietary habits and increase physical activity.

• **High Risk Range:** A visceral fat level of 60 and above is considered high risk. This range significantly increases the likelihood of health problems such as heart disease, diabetes, and metabolic syndrome. It's important to note that these ranges can vary slightly depending on the measurement method and the individual's overall health profile. Regular monitoring and consultation with a healthcare provider are recommended for a comprehensive understanding of one's health status.

5. The Impact on vfr, whr, bmi from Daily Exercise Regime:

Engaging in a daily exercise regime can have a significant impact on various aspects of body composition, such as visceral fat ratio (VFR), waist-to-hip ratio (WHR), and body mass index (BMI). Here's a brief overview of each:

• **Visceral Fat Ratio:** Visceral fat is the fat stored in the abdominal cavity and surrounds important internal organs. ***Regular exercise, especially aerobic and high-intensity workouts, can effectively reduce visceral fat.*** This reduction lowers the risk of health issues like heart disease, type 2 diabetes, and certain cancers.

• **Waist-to-Hip Ratio:** This ratio measures the distribution of body fat. A lower waist-to-hip ratio indicates less abdominal fat relative to hip fat. ***Regular exercise, particularly corestrengthening and cardio exercises, can help reduce waist circumference, thereby improving this ratio.***

• **Body Mass Index (BMI):** BMI is a measure of body fat based on height and weight. While exercise alone may not always significantly reduce weight due to muscle gain, it can lead to a healthier body composition by increasing muscle mass and reducing fat mass.

It's important to note that the impact of exercise on these measures can vary based on factors like the type, intensity, and duration of the exercise, as well as individual differences in genetics, diet, and lifestyle. Additionally, ***combining exercise with a balanced diet enhances its effectiveness in improving body composition***. Regular physical activity is key to maintaining overall health and wellbeing. ***The author's diet, consisting of 1,300 calories daily divided into three meals, results in approximately 433 calories per meal. Utilizing a measure of 10 calories per gram of ingredient, this translates to 43.3 grams per meal in the author's study. Over an 11-year period from 2013 to 2023, the author's average food portion was 80%, leading to an adjusted average of 34.64 grams per meal (calculated as 43.3 x 0.8). Concurrently, the author's average daily steps, recorded over the same period, is 14.63 thousand. This establishes a ratio of averaged food portion to averaged exercise at 2.36, calculated as 34.64 grams per meal divided by 14.63 thousand steps.***

6. MPM Background

To learn more about his developed GH-Method: math-physical medicine (MPM) methodology, readers can read the following three papers selected from his published 760+ papers. The first paper, No. 386 (Reference 1) describes his MPM methodology in a general conceptual format. The second paper, No. 387 (Reference 2) outlines the history of his personalized diabetes research, various application tools, and the differences between biochemical medicine (BCM) approach versus the MPM approach. The third paper, No. 397 (Reference 3) depicts a general flow diagram containing ~10 key MPM research methods and different tools.

7. The Author's Diabetes History

The author was a severe T2D patient since 1995. He weighed 220 lb. (100 kg) at that time. By 2010, he still weighed 198 lb. with an average daily glucose of 250 mg/dL (HbA1C at 10%). During that year, his triglycerides reached 1161 (high risk for CVD and stroke) and his albumin-creatinine ratio (ACR) at 116 (high risk for chronic kidney disease). He also suffered from five cardiac episodes within a decade. In 2010, three independent physicians warned him regarding the need for kidney dialysis treatment and the future high risk of dying from his severe diabetic complications.

In 2010, he decided to self-study endocrinology with an emphasis on diabetes and food nutrition. He spent the entire year of 2014 to develop a metabolism index (MI) mathematical model. During 2015 and 2016, he developed four mathematical prediction models related to diabetes conditions: weight, PPG, fasting plasma glucose (FPG), and HbA1C (A1C). Through using his developed mathematical metabolism index (MI) model and the other four glucose prediction tools, by the end of 2016, his weight was reduced from 220 lbs. (100 kg) to 176 lbs. (89 kg), waistline from 44 inches (112 cm) to 33 inches (84 cm), average fingerpiercing glucose from 250 mg/dL to 120 mg/dL, and A1C from 10% to ~6.5%. One of his major accomplishments is that he no longer takes any diabetes-related medications since 12/8/2015.

In 2017, he achieved excellent results on all fronts, especially his glucose control. However, during the preCOVID period, including both 2018 and 2019, he traveled to ~50 international cities to attend 65+ medical conferences and made ~120 oral presentations. This hectic schedule inflicted damage to his diabetes control caused by stress, dining out frequently, post-meal exercise disruption, and jet lag, along with the overall negative metabolic impact from the irregular life patterns; therefore, his glucose control was somewhat affected during the two-year traveling period of 2018-2019.

He started his COVID-19 selfquarantined life on 1/19/2020. By 10/16/2022, his weight was further reduced to ~164 lbs. (BMI 24.22) and his A1C was at 6.0% without any medication intervention or insulin injection. In fact, with the special COVID-19 quarantine lifestyle since early 2020, not only has he written and published ~500 new research articles in various medical and engineering journals, but he has also achieved his best health conditions for the past 27 years. These achievements have resulted from his non-traveling, low-stress, and regular daily life routines. Of course, his indepth knowledge of chronic diseases, sufficient practical lifestyle management experiences, and his own developed high-tech tools have also contributed to his excellent health improvements.

On 5/5/2018, he applied a continuous glucose monitoring (CGM) sensor device on his upper arm and checks his glucose measurements every 5 minutes for a total of 288 times each day. Furthermore, he extracted the 5minute intervals from every 15minute interval for a total of 96 glucose data each day stored in his computer software.

Through the author's medical research work over 40,000 hours and read over 4,000 published medical papers online in the past 13 years, he discovered and became convinced that good life habits of not smoking, moderate or no alcohol intake, avoiding illicit drugs; along with eating the right food with wellbalanced nutrition, persistent exercise, having a sufficient and good quality of sleep, reducing all kinds of unnecessary stress, maintaining a regular daily life routine contribute to the risk reduction of having many diseases, including CVD, stroke, kidney problems, micro blood vessels issues, peripheral nervous system problems, and even cancers and dementia. In addition, a long-term healthy lifestyle can even "repair" some damaged internal organs, with different required time-length depending on the particular organ's cell lifespan. For example, he has "self-repaired" about 35% of his damaged pancreatic beta cells during the past 10 years.

8. Energy Theory

The human body and organs have around 37 trillion live cells which are composed of different organic cells that require energy infusion from glucose carried by red blood cells; and energy consumption from laborwork or exercise. When the residual energy (resulting from the plastic glucose scenario) is stored inside our bodies, it will cause different degrees of damage or influence to many of our internal organs.

According to physics, energies associated with the glucose waves are proportional to the square of the glucose amplitude. The residual energies from elevated glucoses are circulating inside the body via blood vessels which then impact all of the internal organs to cause different degrees of damage or influence, e.g. diabetic complications. Elevated glucose (hyperglycemia) causes damage to the structural integrity of blood vessels. When it combines with both hypertension (rupture of arteries) and hyperlipidemia (blockage of arteries), CVD or Stroke happens. Similarly, many other deadly diseases could result from these excessive energies which would finally shorten our lifespan. For an example, the combination of hyperglycemia and hypertension would cause micro-blood vessel's leakage in kidney systems which is one of the major cause of CKD.

The author then applied Fast Fourier Transform (FFT) operations to convert the input wave from a time domain into a frequency domain. The y-axis amplitude values in the frequency domain indicate the proportional energy levels associated with each different frequency component of input occurrence. ***Both output symptom value (i.e. strain amplitude in the time domain) and output symptom fluctuation rate (i.e. the strain rate and strain frequency) are influencing the energy level (i.e. the Y-amplitude in the frequency domain).***

Currently, many people live a sedentary lifestyle and lack sufficient exercise to burn off the energy influx which causes them to become overweight or obese. Being overweight and having obesity leads to a variety of chronic diseases, particularly diabetes. In addition, many types of processed food add unnecessary ingredients and harmful chemicals that are toxic to the bodies, which lead to the development of many other deadly diseases, such as cancers. For example, ~85% of worldwide diabetes patients are overweight, and ~75% of patients with cardiac illnesses or surgeries have diabetes conditions.

In engineering analysis, when the load is applied to the structure, it bends or twists, i.e. deform; however, when the load is removed, it will either be restored to its original shape (i.e, elastic case) or remain in a deformed shape (i.e. plastic case). In a biomedical system, the glucose level will increase after eating carbohydrates or sugar from food; therefore, the carbohydrates and sugar function as the energy supply. After having labor work or exercise, the glucose level will decrease. As a result, the exercise burns off the energy, which is similar to load removal in the engineering case. In the biomedical case, both processes of energy influx and energy dissipation take some time which is not as simple and quick as the structural load removal in the engineering case. Therefore, the age difference and 3 input behaviors are "dynamic" in nature, i.e. timedependent. *This time-dependent nature leads to a "viscoelastic or viscoplastic" situation.* ***For the author's case, it is "viscoplastic" since most of his biomarkers are continuously improved during the past 13-year time window.***

Time-dependent output strain and stress of (viscous input*output rate):

Hooke's law of linear elasticity is expressed as:

Strain (ε: epsilon) = Stress (σ: sigma) / Young's modulus (E)

For biomedical glucose application, his developed linear elastic glucose theory (LEGT) is expressed as:

PPG (strain) = carbs/sugar (stress) * GH.p-Modulus (a positive number) + post-meal walking ksteps * GH.w-Modulus (a negative number)

Where GH.p-Modulus is reciprocal of Young's modulus E.

However, in viscoelasticity or viscoplasticity theory, the stress is expressed as:

Stress= viscosity factor (η: eta) * strain rate (dε/dt)

Where strain is expressed as Greek epsilon or ε.

In this article, in order to construct an "ellipse-like" diagram in a stressstrain space domain (e.g. "hysteresis loop") covering both the positive side and negative side of space, he has modified the definition of strain as follows:

Strain= (body weight at certain specific time instant)

He also calculates his strain rate using the following formula:

Strain rate= (body weight at next time instant) - (body weight at present time instant)

The risk probability % of developing into CVD, CKD, Cancer is calculated based on his developed metabolism index model (MI) in 2014. His MI value is calculated using inputs of 4 chronic conditions, i.e. weight, glucose, blood pressure, and lipids; and 6 lifestyle details, i.e. diet, drinking water, exercise, sleep, stress, and daily routines. These 10 metabolism categories further contain ~500 elements with millions of input data collected and processed since 2010. For individual deadly disease risk probability %, his mathematical model contains certain specific weighting factors for simulating certain risk percentages associated with different deadly diseases, such as metabolic disorderinduced CVD, stroke, kidney failure, cancers, dementia; artery damage in heart and brain, micro-vessel damage in kidney, and immunity-related infectious diseases, such as COVID death.

Some of explored deadly diseases and longevity characteristics using the ***viscoplastic medicine theory (VMT)*** include stress relaxation, creep, hysteresis loop, and material stiffness, damping effect ***based on time-dependent stress and strain*** which are different from his previous research findings using ***linear elastic glucose theory (LEGT)*** and ***nonlinear plastic glucose theory (NPGT).***

9. Results

Food (g)					/ 12	/ 0.96	/ 26	Rate	Strain	Strs 1	Strs 2	Strs 3	Hgt 1	Hgt 2	Hgt 3	Area 1	Area 2	Area 3	Time
12/14/23	Food(g)	VFR%	WHR	BMI	VFR%	WHR	BMI	Food(g)	Food(g)	VFR%	WHR	BMI	VFR%	WHR	BMI	VFR%	WHR	BMI	Zone
2013	45.3	20.5	1.1	27.0	1.7	1.2	1.1	0.0	45.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13-18
2014	40.0	20.1	1.1	26.2	1.7	1.1	1.1	-2.0	40.0	-0.4	-2.0	-2.1	-1.7	-1.1	-1.1	3.4	2.0	2.1	61
2015	41.3	18.4	1.0	26.1	1.5	1.0	1.0	-2.0	41.3	-3.1	-2.1	-2.1	-3.2	-2.2	-2.1	6.4	4.4	4.2	25%
2016	38.3	15.6	0.8	25.7	1.3	0.9	1.0	-3.1	38.3	-4.0	-2.7	-3.1	-3.5	-2.4	-2.6	10.7	7.3	8.0	
2017	36.7	15.6	0.8	25.9	1.3	0.9	1.0	-1.5	36.7	-2.0	-1.3	-1.6	-3.0	-2.0	-2.4	4.5	3.0	3.6	
2018	36.2	15.4	0.8	25.5	1.3	0.9	1.0	-0.5	36.2	-0.7	-0.5	-0.5	-1.3	-0.9	-1.0	0.7	0.5	0.5	
2019	33.0	15.8	0.9	25.7	1.3	0.9	1.0	-3.2	33.0	-4.2	-2.9	-3.3	-2.4	-1.7	-1.9	7.7	5.3	6.1	19-23
2020	28.3	15.6	0.8	25.3	1.3	0.9	1.0	-4.7	28.3	-6.2	-4.2	-4.8	-5.2	-3.5	-4.0	24.6	16.7	19.1	186
2021	22.9	16.2	0.9	25.1	1.4	0.9	1.0	-5.5	22.9	-7.4	-5.0	-5.5	-6.8	-4.6	-5.1	36.8	25.0	27.9	75%
2022	21.6	16.4	0.9	25.2	1.4	0.9	1.0	-1.3	21.6	-1.7	-1.2	-1.3	-4.6	-3.1	-3.4	5.8	3.9	4.3	
2023	20.8	16.0	0.9	25.0	1.3	0.9	1.0	-0.8	20.8	-1.1	-0.7	-0.8	-1.4	-1.0	-1.0	1.1	0.8	0.8	
Avg	33.4	16.9	0.9	25.7	1.4	1.0	1.0	-2.2	33.4	-3.1	-2.1	-2.3	-3.0	-2.0	-2.2	101.7	69.1	76.5	
Correl.	100%	62%	63%	91%										SD-E:	247	41%	28%	31%	

Ksteps					/ 12	/ 0.96	/ 26	Rate	Strain	Strs 1	Strs 2	Strs 3	Hgt 1	Hgt 2	Hgt 3	Area 1	Area 2	Area 3	Time
12/13/23	Kstep	VFR%	WHR	BMI	VFR%	WHR	BMI	Kstep	Kstep	VFR%	WHR	BMI	VFR%	WHR	BMI	VFR%	WHR	BMI	Zone
2013	7.49	20.50	1.10	26.95	1.71	1.16	1.08	0.00	7.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13-18
2014	11.77	20.10	1.09	26.17	1.68	1.14	1.06	4.27	11.77	7.16	4.86	4.47	3.68	2.43	2.24	15.30	10.39	9.56	104
2015	15.00	18.40	0.99	26.05	1.53	1.04	1.04	3.23	15.00	4.95	3.37	3.37	6.06	4.11	3.92	19.56	13.28	12.66	87%
2016	17.02	15.60	0.84	25.73	1.30	0.88	1.03	2.02	17.02	2.63	1.79	2.08	3.79	2.58	2.72	7.65	5.20	5.50	
2017	17.86	15.60	0.84	26.03	1.30	0.88	1.04	0.86	17.86	1.10	0.76	0.88	1.06	1.27	1.48	1.58	1.07	1.26	
2018	18.46	15.40	0.83	25.45	1.28	0.87	1.02	0.59	18.46	0.76	0.52	0.61	0.93	0.63	0.74	0.55	0.38	0.44	
2019	15.74	15.80	0.85	25.66	1.32	0.89	1.03	-2.72	15.74	-3.58	-2.43	-2.79	-1.41	-0.96	-1.09	3.82	2.59	2.96	19-23
2020	16.20	15.60	0.84	25.20	1.30	0.88	1.01	0.51	16.20	0.67	0.45	0.52	-1.45	-0.99	-1.13	-0.75	-0.51	-0.50	10
2021	14.57	16.20	0.87	25.05	1.35	0.92	1.00	-1.69	14.57	-2.28	-1.55	-1.69	-0.81	-0.55	-0.59	1.36	0.92	0.99	13%
2022	13.79	16.40	0.88	25.15	1.37	0.93	1.01	-0.78	13.79	-1.06	-0.72	-0.78	-1.67	-1.13	-1.24	1.30	0.88	0.96	
2023	12.94	16.00	0.86	24.96	1.33	0.91	1.00	-0.85	12.94	-1.13	-0.77	-0.85	-1.10	-0.74	-0.82	0.93	0.63	0.69	
Avg	14.63	16.87	0.91	25.67	1.41	0.96	1.03	0.50	14.63	0.84	0.57	0.53	0.89	0.60	0.57	51.31	34.84	34.44	
Correl.	100%	-83%	-82%	-50%										SD-E:	121	43%	29%	29%	

VFR							/ 1	/ 1	/ 1	/ 1	/ 1	Rate	Strain	Strs 1	Strs 2	Strs 3	Strs 4	Strs 5	Hgt 1	Hgt 2	Hgt 3	Hgt 4	Hgt 5	Area 1	Area 2	Area 3	Area 4	Area 5	Time
12/13/23	VFR%	T2D	Food(P)	Food(G)	Steps	Sleep	T2D	Food(P)	Food(G)	Steps	Sleep	VFR%	VFR%	T2D	Food(P)	Food(G)	Steps	Sleep	T2D	Food(P)	Food(G)	Steps	Sleep	T2D	Food(P)	Food(G)	Steps	Sleep	Zone
2013	20.5	1.1	1.2	0.8	1.3	1.0	1.1	1.2	0.8	1.3	1.0	0.0	20.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13-18
2014	20.1	1.1	1.0	0.5	0.9	0.7	1.1	1.0	0.5	0.9	0.7	-0.4	20.1	-0.5	-0.4	-0.2	-0.4	-0.3	-0.2	-0.2	-0.1	-0.2	-0.1	0.1	0.1	0.0	0.1	0.1	31
2015	18.4	1.1	0.9	0.6	0.7	0.6	1.1	0.9	0.6	0.7	0.6	-1.7	18.4	-1.6	-1.6	-0.9	-1.2	-1.1	-1.1	-1.0	-0.6	-0.8	-0.7	1.9	1.7	1.0	1.3	1.2	97%
2016	15.6	1.0	0.9	0.6	0.6	0.6	1.0	0.9	0.6	0.6	0.6	-2.8	15.6	-2.8	-2.6	-1.5	-1.7	-1.6	-2.3	-2.0	-1.2	-1.5	-1.4	6.5	5.7	3.5	4.1	4.0	
2017	15.6	1.0	0.8	0.5	0.6	0.6	1.0	0.8	0.5	0.6	0.6	0.0	15.6	0.0	0.0	0.0	0.0	0.0	-1.4	-1.2	-0.8	-0.9	-0.8	0.0	0.0	0.0	0.0	0.0	
2018	15.4	1.0	0.8	0.5	0.6	0.6	1.0	0.8	0.5	0.6	0.6	-0.2	15.4	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	
2019	15.8	1.0	0.8	0.5	0.7	0.6	1.0	0.8	0.5	0.7	0.6	0.4	15.8	0.4	0.3	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	19-23
2020	15.6	0.9	0.7	0.5	0.6	0.6	0.9	0.7	0.5	0.6	0.6	-0.2	15.6	-0.2	-0.1	-0.1	-0.1	-0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	1
2021	16.2	0.9	0.5	0.5	0.7	0.6	0.9	0.5	0.5	0.7	0.6	0.6	16.2	0.5	0.3	0.3	0.4	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	3%
2022	16.4	0.9	0.5	0.5	0.8	0.5	0.9	0.5	0.5	0.8	0.5	0.2	16.4	0.2	0.1	0.1	0.2	0.1	0.4	0.2	0.2	0.3	0.2	0.1	0.0	0.0	0.1	0.0	
2023	16.0	0.8	0.5	0.5	0.8	0.5	0.8	0.5	0.5	0.8	0.5	-0.4	16.0	-0.3	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	
Avg	16.9	1.0	0.8	0.5	0.8	0.6	1.0	0.8	0.5	0.8	0.6	-0.4	16.9	-0.4	-0.4	-0.2	-0.3	-0.3	-0.4	-0.4	-0.2	-0.3	-0.3	8.7	7.6	4.6	5.7	5.4	
Correl.	100%	76%	88%	71%	81%	70%																SD-E:	32	27%	24%	14%	18%	17%	

VFR						/ 1	/ 1	/ 1	/ 1	Rate	Strain	Strs 1	Strs 2	Strs 3	Strs 4	Hgt 1	Hgt 2	Hgt 3	Hgt 4	Area 1	Area 2	Area 3	Area 4	Time
12/13/23	VFR%	BW	T2D	BP	Lipid	BW	T2D	BP	Lipid	VFR%	VFR%	BW	T2D	BP	Lipid	BW	T2D	BP	Lipid	BW	T2D	BP	Lipid	Zone
2013	20.5	1.1	1.1	1.1	0.6	1.1	1.1	1.1	0.6	0.0	20.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13-18
2014	20.1	1.1	1.1	1.0	0.4	1.1	1.1	1.0	0.4	-0.4	20.1	-0.4	-0.5	-0.4	-0.2	-0.2	-0.2	-0.2	-0.1	0.1	0.1	0.1	0.0	29
2015	18.4	1.1	1.1	0.9	0.7	1.1	1.1	0.9	0.7	-1.7	18.4	-1.6	-1.6	-1.6	-1.2	-1.1	-1.1	-1.0	-0.7	1.9	1.9	1.7	1.1	97%
2016	15.6	1.0	1.0	0.9	0.6	1.0	1.0	0.9	0.6	-2.8	15.6	-2.9	-2.8	-2.4	-1.6	-2.3	-2.3	-2.0	-1.4	6.5	6.5	5.8	3.9	
2017	15.6	1.0	1.0	0.8	0.4	1.0	1.0	0.8	0.4	0.0	15.6	0.0	0.0	0.0	0.0	-1.4	-1.4	-1.2	-0.8	0.0	0.0	0.0	0.0	
2018	15.4	1.0	1.0	0.9	0.4	1.0	1.0	0.9	0.4	-0.2	15.4	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	
2019	15.8	1.0	1.0	0.9	0.7	1.0	1.0	0.9	0.7	0.4	15.8	0.4	0.4	0.4	0.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	19-23
2020	15.6	1.0	0.9	0.8	0.6	1.0	0.9	0.8	0.6	-0.2	15.6	-0.2	-0.2	-0.2	-0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	1
2021	16.2	1.0	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.6	16.2	0.6	0.5	0.5	0.5	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	3%
2022	16.4	1.0	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.2	16.4	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.1	0.1	0.1	0.1	
2023	16.0	1.0	0.8	0.9	0.6	1.0	0.8	0.9	0.6	-0.4	16.0	-0.4	-0.3	-0.4	-0.3	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	
Avg	16.9	1.0	1.0	0.9	0.6	1.0	1.0	0.9	0.6	-0.4	16.9	-0.4	-0.4	-0.4	-0.2	-0.4	-0.4	-0.3	-0.2	8.7	8.7	7.5	5.3	
Correl.	100%	82%	76%	84%	7%													SD-E:	30	20%	20%	26%	17%	

VFR							/ 1	/ 1	/ 1	/ 1	/ 1	Rate	Strain	Strs 1	Strs 2	Strs 3	Strs 4	Strs 5	Hgt 1	Hgt 2	Hgt 3	Hgt 4	Hgt 5	Area 1	Area 2	Area 3	Area 4	Area 5	Time
12/13/23	VFR%	CVD	CKD	Cancer	AD	PD	CVD	CKD	Cancer	AD	PD	VFR%	VFR%	CVD	CKD	Cancer	AD	PD	CVD	CKD	Cancer	AD	PD	CVD	CKD	Cancer	AD	PD	Zone
2013	20.5	84	85	50	58	48	84	85	50	58	48	0.0	20.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13-18
2014	20.1	72	82	48	57	46	72	82	48	57	46	-0.4	20.1	-28.8	-32.8	-19.2	-22.8	-18.4	-14.4	-16.4	-9.6	-11.4	-9.2	5.8	6.6	3.8	4.6	3.7	2207
2015	18.4	60	79	42.8	52	45	60	79	42.8	52	45	-1.7	18.4	-102.0	-134.3	-72.4	-88.4	-76.5	-60.4	-83.8	-46.8	-55.6	-47.8	111.2	142.2	77.8	94.5	80.7	97%
2016	15.6	56	72	40.2	47	42	56	72	40.2	47	42	-2.8	15.6	-156.8	-201.6	-112.6	-131.6	-117.6	-129.4	-166.0	-92.5	-110.0	-97.1	362.3	470.3	259.0	308.0	271.7	
2017	15.6	55	70	38.9	45	41	55	70	38.9	45	41	0.0	15.6	0.0	0.0	0.0	0.0	0.0	-78.4	-100.8	-56.3	-65.8	-58.8	0.0	0.0	0.0	0.0	0.0	
2018	15.4	55	71	38.6	47	41	55	71	38.6	47	41	-0.2	15.4	-11.0	-14.2	-7.7	-9.4	-8.2	-5.5	-7.1	-3.9	-4.7	-4.1	1.1	1.4	0.8	0.9	0.8	
2019	15.8	57	71	40.1	48	42	57	71	40.1	48	42	0.4	15.8	22.8	28.4	16.0	19.2	16.8	5.9	7.1	4.2	4.9	4.3	2.4	2.8	1.7	2.0	1.7	19-23
2020	15.6	52	67	38	43	39	52	67	38	43	39	-0.2	15.6	-10.4	-13.4	-7.6	-8.6	-7.8	6.2	7.3	4.2	5.3	4.5	-1.2	-1.5	-0.8	-1.1	-0.9	60
2021	16.2	53	67	39.1	45	39	53	67	39.1	45	39	0.6	16.2	31.8	40.2	23.5	27.0	23.4	10.7	13.4	7.8	9.2	7.8	6.4	8.0	4.8	5.5	4.7	3%
2022	16.4	52	66	38.7	44	39	52	66	38.7	44	39	0.2	16.4	10.4	13.2	7.7	8.8	7.8	21.1	26.7	15.6	17.9	15.6	4.2	5.3	3.1	3.6	3.1	
2023	16.0	53	68	39.7	43	37	53	68	39.7	43	37	-0.4	16.0	-21.2	-27.2	-15.9	-17.2	-14.8	-5.4	-7.0	-4.1	-4.2	-3.5	2.2	2.8	1.6	1.7	1.4	
Avg	16.9	59	72.6	41.3	48.1	41.73	59	72.6	41.3	48.1	41.7	-0.4	16.9	-24.1	-31.1	-17.1	-20.2	-17.6	-23.2	-29.8	-16.4	-19.5	-17.1	494	638	352	420	367	
Correl.	100%	81%	91%	86%	82%	84%																SD-E:	2270	22%	20%	15%	18%	16%	

Figure 1: Five Data Tables

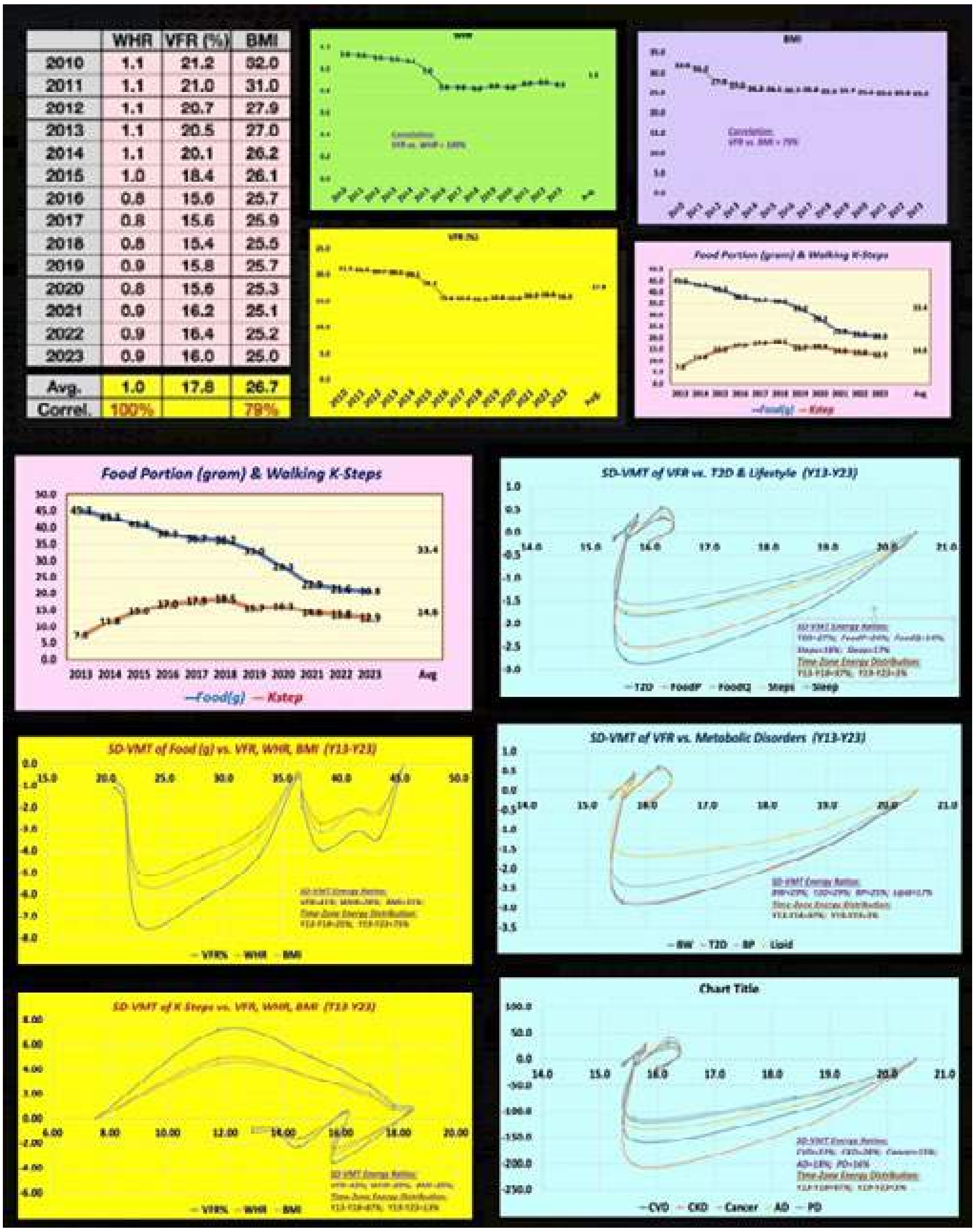

Figure 2: Inputs and SD-VMT Energy Output Diagram

10. Conclusions

In summary, the author utilized the space-domain viscoplastic medicine energy theory (SD-VMT) to explore dynamic interactions between annual VFR and other inter-related factors over 11 years. The summarized findings, based on SD-VMT energies, are:

For food portion versus 3factor:
VFR (41%) > BMI (31%) > WHR (28%) & Total diet energy= 247

For walking k-steps versus 3 factors:
VFR (43%) > BMI (29%) = WHR (29%) & Total exercise energy = 121
Note: The ratio of diet energy to exercise energy is 2.04 (247/121)

For VFR versus 5 lifestyle factors:
T2D (37%) > Food Portion (24%) > Steps (18%) > Sleep (17%) > Food Quality (14%)

For VFR versus 4 metabolic disorder factors:
Obesity (29%) = Type 2 Diabetes (39%) > Hypertension (25%) > Dyslipidemia (27%)

For VFR versus 5 mortality diseases:
CKD (28%) > CVD (22%) > AD (18%) > PD (16%) > Cancers (15%)

Key Message

Effective overweight ad obesity management, crucial in preventing T2D, can be achieved through a consistent exercise regime and a portion-controlled diet. Diet control, which includes both portion and quality, is more effective than exercise alone, with a diet-toexercise importance ratio of 2.04. Eliminating visceral fat is challenging and requires effective exercise strategies, persistence, and patience. Metabolic conditions like hypertension and dyslipidemia often accompany or result from diabetes. Overweight or obesity can lead to metabolic disorders, increasing the risk of severe diseases like CVD, CKD, various cancers, and dementia. Study No. 997 uses the author's personal data and experiences to demonstrate a research methodology for assessing health risks associated with these mortality diseases, providing insights for others to evaluate their own health risks.

References:

For editing purposes, majority of the references in this paper, which are self-references, have been removed for this article. Only references from other authors' published sources remain. The bibliography of the author's original self-references can be viewed at www.eclairemd.com. Readers may use this article as long as the work is properly cited, and their use is educational and not for profit, and the author's original work is not altered.For reading more of the author's published VGT or FD analysis results on medical applications, please locate them through platforms for scientific research publications, such as ResearchGate, Google Scholar, etc.