

The GH-Method

Viscoelastic Medicine theory (VMT #378): Relationships of Parkinson's disease risks and five inputs of BMI, WHR, eAG, Diet and Exercise using viscoplastic energy model of GH-Method: math-physical medicine (No. 979)

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Abstract

Diabetes is believed to affect up to 81% of those with Alzheimer's diseases (AD). Additionally, 50% to 80% (averaged 65%) of Parkinson's disease (PD) patients may have diabetes. In a comprehensive meta-analysis based on 7 observational cohort studies analyzing the impact of diabetes on the risk of PD in over 1,761,000 individuals. It is noted that, compared to non-diabetic patients, patients with diabetes were associated with a 38% increase in the risk of developing PD, with an increased risk of 50% and 40% in female and in male, respectively.

From a pathophysiological standpoint, Parkinson's disease is intricately linked to metabolic disorders, particularly obesity and type 2 diabetes. Body weight, assessed through BMI and WHR, along with blood glucose levels, directly correlates with both diet and exercise.

Hence, the author explores his estimated Parkinson's disease (PD) risks associated with five inputs: BMI, WHR, eAG, diet (food portion and meal quality), and walking steps, based on personal data collected between 1/1/2013 and 11/30/2023.

The author, having experienced complications from metabolic disorders, has been motivated to conduct numerous studies exploring the connection between mortality diseases and their key inputs. Notably, the waist-to-hip ratio (WHR), reflective of visceral fat, is introduced as a new variable in this analysis—an aspect seldom considered in the author's prior studies.

Keywords: Viscoelastic; Viscoplastic; Diabetes; Glucose; Biomarkers; Insulin; Hyperglycemia; Dementia

Abbreviations: CGM: continuous glucose monitoring; eAG: estimated average glucose; T2D: type 2 diabetes; PPG: postprandial plasma glucose; FPG: fasting plasma glucose; SD: space-domain; VMT: viscoelastic medicine theory; FFT: Fast Fourier Transform

In summary, a statistical correlation analysis unveils robust correlations (84% to 97%) between the author's PD risk and four inputs, with a much lower 55% correlation with walking steps. This lower correlation is attributed to variations in his walking steps, ranging from 7.5k in 2013, increasing to 18.5k in 2018, later reducing to 12.7k in 2023 due to age-related discomfort from excessive walking.

Applying the space-domain viscoplastic energy (SD-VMT) method, the author reveals hidden relationships and dynamics (i.e. energies) between these 5 inputs and annual PD risk output: - BMI Energy: 24%; - WHR Energy: 22%; - eAG Energy: 23%; - Diet Energy: 16%; - Steps Energy: 16%.

Key message:

The author's three metabolic biomarkers, BMI, WHR, and eAG, contribute 22% to 24% each (totaling 69%), while lifestyle details, diet and exercise, contribute 16% each (totaling 32%). This 69% to 32% split aligns with the author's defined Da-Vinci code of medicine, reflecting a 70 to 30 ratio. Lifestyles significantly impact metabolic disorders, thereby influencing mortality diseases like PD. It is important to note that the author hasn't been diagnosed with any signs of Parkinson's diseases. Despite lacking real data observations for direct comparison, this research, from a preventive medicine perspective, offers valuable insights into the author's health maintenance program.

1. INTRODUCTION

Diabetes is believed to affect up to 81% of those with Alzheimer's diseases (AD). Additionally, 50% to 80% (averaged 65%) of Parkinson's disease (PD) patients may have diabetes. In a comprehensive meta-analysis based on 7 observational cohort studies analyzing the impact of diabetes on the risk of PD in over 1,761,000 individuals. It is noted that, compared to non-diabetic patients, patients with diabetes were associated with a 38% increase in the risk of developing PD, with an increased risk of 50% and 40% in female and in male, respectively.

From a pathophysiological standpoint, Parkinson's disease is intricately linked to metabolic disorders, particularly obesity and type 2 diabetes. Body weight, assessed through BMI and WHR, along with blood glucose levels, directly correlates with both diet and exercise.

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The author, having experienced complications from metabolic disorders, has been motivated to conduct numerous studies exploring the connection between mortality diseases and their key inputs. Notably, the waist-to-hip ratio (WHR), reflective of visceral fat, is introduced as a new variable in this analysis—an aspect seldom considered in the author's prior studies.

1.1 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.

Pathophysiological explanations of Parkinson's disease and obesity/diabetes:

The pathophysiological connections between Parkinson's disease (PD) and obesity/diabetes involve intricate mechanisms:

Insulin Resistance and Neuroinflammation: Insulin resistance, a characteristic of diabetes and obesity, can extend to the brain and contribute to neuroinflammation. In Parkinson's disease, inflammation in the brain is implicated in the degeneration of dopaminergic neurons.

Dopaminergic System Dysfunction: Both obesity and diabetes have been associated with alterations in the dopaminergic system, which plays a crucial role in Parkinson's disease. Changes in dopamine levels and receptor function may contribute to the development or progression of PD.

Mitochondrial Dysfunction: Parkinson's disease is characterized by mitochondrial dysfunction, and obesity/diabetes can also impact mitochondrial health. Impaired mitochondrial function may contribute to oxidative stress and neuronal damage seen in PD.

Alpha-Synuclein Accumulation: Obesity and diabetes may influence the aggregation of alpha-synuclein, a protein associated with PD pathology. Abnormal accumulation of alpha-synuclein is a hallmark of Parkinson's disease.

Vascular Factors: Diabetes and obesity can contribute to vascular changes, affecting blood flow to the brain. Vascular factors are increasingly recognized as potential contributors to neurodegenerative diseases, including Parkinson's.

Neurotrophic Factors: Diabetes and obesity may influence neurotrophic factors, which play a role in the survival and function of neurons. Changes in these factors could contribute to the neurodegenerative processes observed in PD.

Understanding these complex interactions is crucial for developing targeted interventions. Lifestyle modifications, such as maintaining

a healthy weight, regular exercise, and managing metabolic health, may have implications for both preventing and managing Parkinson's disease. However, it is important to note that research in this field is ongoing, and the relationships between these conditions are multifaceted.

Dopaminergic system:

The dopaminergic system is a neural network in the brain that relies on the neurotransmitter dopamine. Dopamine plays a crucial role in various physiological functions, including mood regulation, motor control, and reward-driven learning. The dopaminergic system is particularly significant in conditions like Parkinson's disease and is involved in complex processes such as:

Motor Control:

Dopamine-producing neurons in specific brain regions, including the substantia nigra, are essential for coordinating smooth and controlled movements. Dysfunction of the dopaminergic system, as seen in Parkinson's disease, can result in motor impairments like tremors, stiffness, and bradykinesia (slowed movements).

Reward and Pleasure:

Dopamine is involved in the brain's reward system, influencing motivation, reinforcement learning, and the experience of pleasure. Disruptions in the dopaminergic pathways can contribute to conditions like addiction or mood disorders.

Cognition:

Dopamine is implicated in cognitive functions such as memory, attention, and problem-solving. Changes in the dopaminergic system are associated with cognitive decline in conditions like Parkinson's disease and some forms of dementia.

Emotional Regulation:

Dopamine plays a role in regulating emotions, and imbalances in the dopaminergic system are linked to mood disorders such as depression and bipolar disorder.

In Parkinson's disease, the degeneration of dopaminergic neurons in the substantia nigra leads to a shortage of dopamine, causing motor symptoms. Understanding the dopaminergic system is crucial for developing treatments that aim to modulate dopamine

levels and improve the symptoms associated with disorders like Parkinson's.

Mitochondrial function:

Mitochondrial function refers to the health and efficiency of mitochondria, which are cellular organelles responsible for producing energy in the form of adenosine triphosphate (ATP). Proper mitochondrial function is essential for various cellular processes and overall cellular health.

In the context of health and disease, disturbances in mitochondrial function can have significant implications. Impaired mitochondrial function is associated with various conditions, including neurodegenerative diseases, metabolic disorders, and aging. Mitochondrial dysfunction may lead to a decrease in energy production, increased production of reactive oxygen species (ROS), and disruption of cellular processes.

Maintaining healthy mitochondrial function is crucial for overall cellular and organ health. Lifestyle factors such as regular exercise, a balanced diet, and stress management can positively influence mitochondrial function. Researchers are actively exploring the link between mitochondrial health and various diseases to develop strategies for preventing or treating conditions associated with mitochondrial dysfunction.

Neurotrophic Factors:

Neurotrophic factors are a family of proteins that support the growth, survival, and differentiation of neurons (nerve cells) in the nervous system. These factors play a crucial role in the development, maintenance, and repair of the nervous system. Here are key points about neurotrophic factors:

Promoting Neuronal Growth:

Neurotrophic factors stimulate the growth of nerve fibers (axons and dendrites) and promote the formation of new synapses, which are essential for communication between neurons.

Preventing Cell Death:

They help prevent apoptosis, a process of programmed cell death, in neurons. This anti-apoptotic effect is vital for the survival and maintenance of neurons throughout the lifespan.

Facilitating Synaptic Plasticity:

Neurotrophic factors contribute to synaptic plasticity, which is the ability of synapses to strengthen or weaken over time. This is crucial for learning and memory processes.

Supporting Nerve Regeneration:

In cases of injury or damage to the nervous system, neurotrophic factors play a role in supporting nerve regeneration and repair.

Diverse Functions:

Different types of neurotrophic factors exist, including nerve growth factor (NGF), brain-derived neurotrophic factor (BDNF), and neurotrophin-3 (NT-3), among others. Each has specific functions and is active in different regions of the nervous system.

Implications in Neurological Disorders:

Dysregulation of neurotrophic factors has been implicated in various neurological disorders, including neurodegenerative diseases such as Alzheimer's and Parkinson's. Therapeutic strategies targeting these factors are being explored for potential neuroprotective effects.

Understanding the role of neurotrophic factors is crucial for advancing research and developing treatments that aim to support and protect neurons in both health and disease.

Which foods contain antioxidants and anti-inflammatory compounds?

Foods rich in antioxidants and anti-inflammatory compounds can help combat oxidative stress and inflammation. Here are some examples:

Fruits:

- Berries (blueberries, strawberries, raspberries)
- Citrus fruits (oranges, grapefruits)
- Cherries
- Apples
- Grapes

Vegetables:

- Leafy greens (spinach, kale, Swiss chard)
- Broccoli
- Brussels sprouts
- Bell peppers
- Tomatoes

Nuts and Seeds

- Almonds
- Walnuts

- Chia seeds
- Flaxseeds

Herbs and Spices:

- Turmeric
- Ginger
- Garlic
- Cinnamon
- Rosemary

Fatty Fish:

- Salmon
- Mackerel
- Sardines
- Trout

Green Tea:

- Contains polyphenols with antioxidant and anti-inflammatory properties.

Dark Chocolate:

- In moderation, dark chocolate with a high cocoa content provides antioxidants.

Olive Oil:

- Extra virgin olive oil contains polyphenols and has anti-inflammatory effects.

Whole Grains:

- Quinoa
- Brown rice
- Oats

Legumes:

- Lentils
- Chickpeas
- Black beans

Incorporating a variety of these foods into your diet can contribute to a well-rounded intake of antioxidants and anti-inflammatory compounds. It's essential to focus on a balanced and diverse diet to provide your body with a range of nutrients.

1.2 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.

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 finger-piercing 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 pre-COVID 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 self-quarantined 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 in-depth 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 5-minute intervals from every 15-minute 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 well-balanced 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.

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 labor-work 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. time-dependent. 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:

$$\text{Strain } (\epsilon: \text{epsilon}) = \text{Stress } (\sigma: \text{sigma}) / \text{Young's modulus } (E)$$

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

$$\text{PPG (strain)} = \text{carbs/sugar (stress)} * \text{GH.p-Modulus (a positive number)} + \text{post-meal walking k-steps} * \text{GH.w-Modulus (a negative number)}$$

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

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

$$\text{Stress} = \text{viscosity factor } (\eta: \text{eta}) * \text{strain rate } (d\epsilon/dt)$$

where strain is expressed as Greek epsilon or ϵ .

In this article, in order to construct an "ellipse-like" diagram in a stress-strain 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 a 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 disorder-induced 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).

2. RESULTS

Figure 1 shows data table, Time-domain curves and SD-VMT energies.

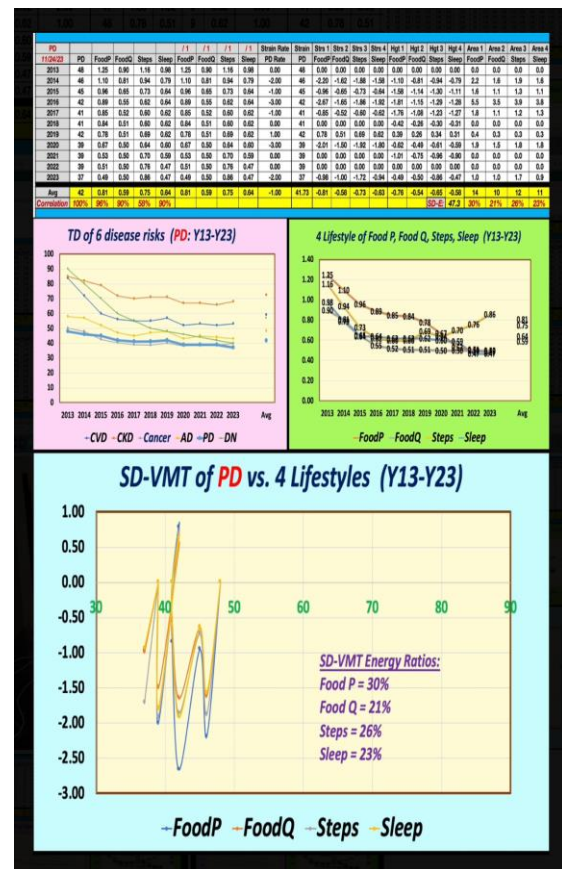
3. CONCLUSION

In summary, a statistical correlation analysis unveils robust correlations (84% to 97%) between the author's PD risk and four inputs, with a much lower 55% correlation with walking steps. This lower correlation is attributed to variations in his walking steps, ranging from 7.5k in 2013, increasing to 18.5k in 2018, later reducing to 12.7k in 2023 due to age-related discomfort from excessive walking.

Applying the space-domain viscoplastic energy (SD-VMT) method, the author reveals hidden relationships and dynamics (i.e. energies) between these 5 inputs and annual PD risk output:

- BMI Energy: 24%
- WHR Energy: 22%
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Figure 1: Data table, Time-domain curves and SD-VMT energies



Key message:

The author's three metabolic biomarkers, BMI, WHR, and eAG, contribute 22% to 24% each (totaling 69%), while lifestyle details, diet and exercise, contribute 16% each (totaling 32%). This 69% to 32% split aligns with the author's defined Da-Vinci code of medicine, reflecting a 70 to 30 ratio. Lifestyles significantly impact metabolic disorders, thereby influencing mortality diseases like PD. It is important to note that the author hasn't been diagnosed with any signs of Parkinson's diseases. Despite lacking real data observations for direct comparison, this research, from a preventive medicine

perspective, offers valuable insights into the author's health maintenance program.

4. 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.

Viscoelastic and Viscoplastic Glucose Theory Application in Medicine

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