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Relationships Between Stress And Four Diseases, Type 2 Diabetes, Heart Diseases, Kidney Diseases, And Diabetic Neuropathy Using Viscoplastic Energy Model Of Ghmethod: Math-Physical Medicine (No. 958, VMT #357, 11/19/2023)

Gerald C Hsu*

EclaireMD Foundation, USA

***Corresponding Author**
Gerald C Hsu, EclaireMD Foundation, USA

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Abstract

Inspired by a recent presentation at the European Association for the Study of Diabetes (EASD) in 2023, exploring the correlation between stress, fear, or psychological disorders, and four diseases, i.e. type 2 diabetes (T2D), cardiovascular diseases (CVD), chronic kidney diseases (CKD), and diabetic neuropathy (DN). This study focused on 2,067,017 T2D patients in South Korea over 6.2 years. An additional four-year study from the REACH International Registry revealed significant risks for type 2 diabetes mellitus (T2DM) patients, indicating a 2.45 times higher risk of cardiovascular death for those with heart failure compared to those without. Patients with T2DM and early CKD experienced a reduced life expectancy by 16 years, a stark 10-year difference compared to patients with CKD alone. Further studies demonstrated a 15% increase in the risk of death for heart failure patients with every 0.5 mg/dL rise in creatinine.

The author of this paper drew from personal data collected over the past 11 years (from 1/1/2013 to 11/17/2023), examining stress and fear scores in the context of the mentioned four diseases. His stress scores encompass about 100 elements for both "psychologically normal" individuals and psychological disorders (PD) patients, including borderline personality disorder (BPD). Notably, the author lacks psychological disorders, ensuring that his collected data reflects a normal person's response to stress or fear from health situations, business issues, people relationships, or life incidents. Over the past 11 years, his primary stress sources originated from emotional reactions to his enduring diabetic complications, including CVD, CKD, DN (foot ulcers), and retinopathy. Beyond traditional statistical correlations, this article also employs the space-domain viscoplastic energy (SD-VMT) method from advanced engineering to unveil hidden relationships and dynamics (i.e., energies) among these four diseases and the author's collected stress scores.

***In summary,** traditional statistical calculations reveal correlations between his stress and his four complications:*

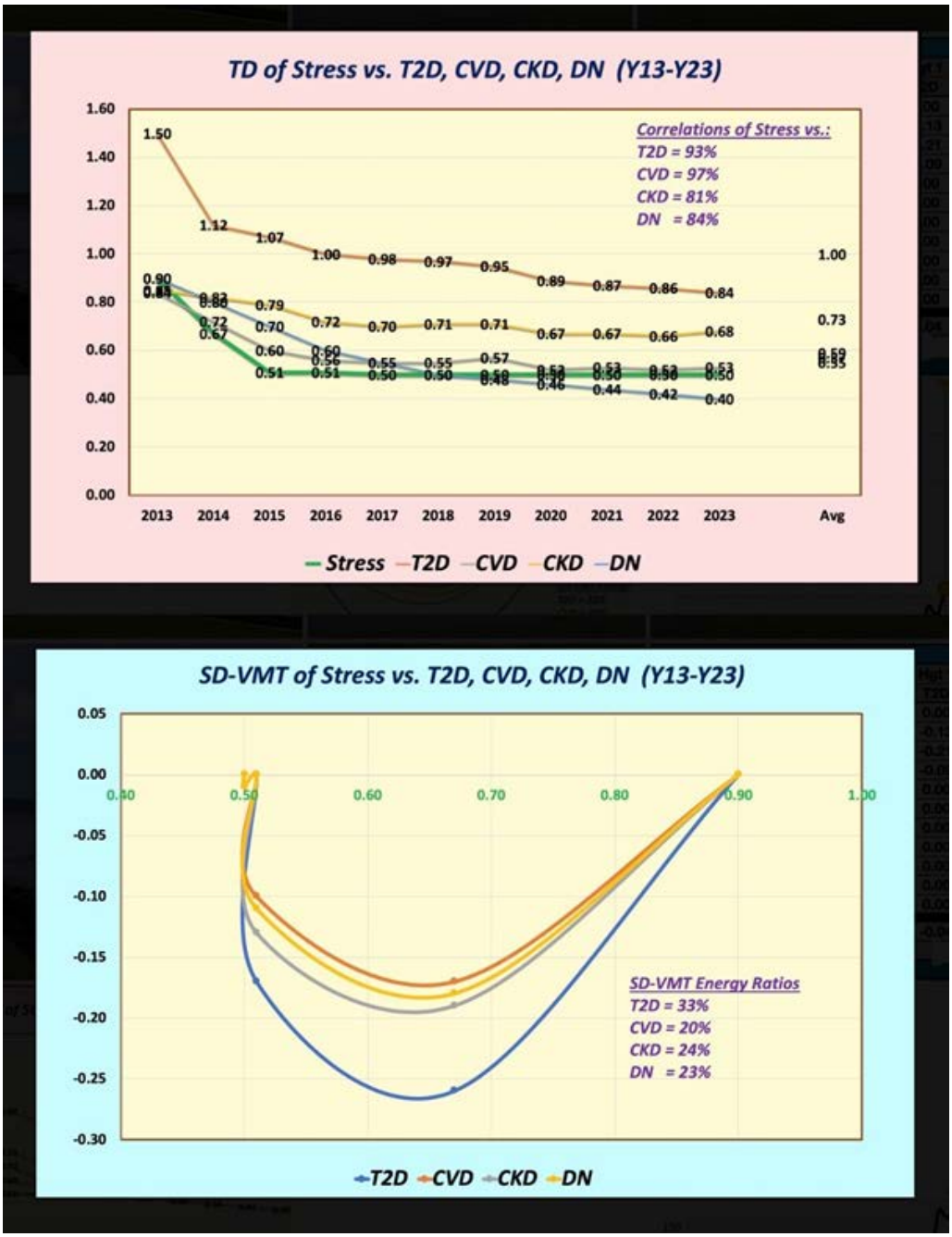
- ***Stress vs. T2D: 93%***
- ***Stress vs. CVD: 97%***
- ***Stress vs. CKD: 81%***
- ***Stress vs. DN: 84%***

Applying the SD-VMT energy method, this study identifies four energy contribution margins on his stress from four diseases:

- ***Energy from T2D: 33%***
- ***Energy from CVD: 20%***
- ***Energy from CKD: 24%***
- ***Energy from DN: 23%***

*Over the past 11 years, the author's primary stress source has been concerns about his overall health and longevity resulting from his existing diabetic complications and the potential threat of cancers. **His four disease diagnosis dates include T2D since 1995 (long lasting), 5 CVD episodes from 1994 to 2005 (earlier years), CKD diagnosed in 2010 and DN in 2013 (more recently).** His time-domain data and curves reveal the hierarchy of stress and SD-VMT energies associated with his internal stress and fears: T2D 33%, CKD 24%, DN 23%, and CVD 20%.*

Diabetes is the root cause of other complications and fears.



1. Introduction

Inspired by a recent presentation at the European Association for the Study of Diabetes (EASD) in 2023, exploring the correlation between stress, fear, or psychological disorders, and four diseases, i.e. type 2 diabetes (T2D), cardiovascular diseases (CVD), chronic kidney diseases (CKD), and diabetic neuropathy (DN). This study focused on 2,067,017 T2D patients in South Korea over 6.2 years. An additional four-year study from the REACH International Registry revealed significant risks for type 2 diabetes mellitus (T2DM) patients, indicating a 2.45 times higher risk of cardiovascular death for those with heart failure compared to those without. Patients with T2DM and early CKD experienced a reduced life expectancy by 16 years, a stark 10-year difference compared to patients with CKD alone. Further studies demonstrated a 15% increase in the risk of death for heart failure patients with every 0.5 mg/dL rise in creatinine.

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energies) among these four diseases and the author's collected stress scores.

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. Pathophysiological Explanations of Internal Stress Resulted from fears Regarding Various Diseases, such as Diabetes, CVD, CKD, Neuropathy:

Internal stress or fear resulting from diseases like type 2 diabetes, cardiovascular diseases (CVD), chronic kidney diseases (CKD), and diabetic neuropathy (DN) can be attributed to pathophysiological factors specific to each condition.

3.1 Diabetes (T2D)

• Insulin Dysregulation: In diabetes, the body's inability to regulate insulin leads to abnormal blood glucose levels, causing metabolic stress.

• Microvascular Damage: The disease can result in microvascular damage, impacting organs and tissues, contributing to the fear of complications like neuropathy (lower foot amputation) and retinopathy (blindness).

3.2 Cardiovascular Diseases (CVD)

• Atherosclerosis: CVD often involves the buildup of plaque in arteries, leading to reduced blood flow and increased risk of heart attacks or strokes, causing internal stress.

• Cardiac Dysfunction: Conditions like heart failure can result in impaired cardiac function, contributing to anxiety and fear.

3.3 Chronic Kidney Diseases (CKD)

• Renal Dysfunction: CKD is characterized by impaired kidney function, leading to a buildup of waste products and fluid imbalance, causing physiological stress.

• Electrolyte Imbalance: Disruptions in electrolyte balance can contribute to internal stress and complications associated with CKD.

3.4 Diabetic Neuropathy (DN)

• Nerve Damage: In neuropathy, nerve damage disrupts the transmission of signals between the peripheral nervous system and the central nervous system, causing pain and anxiety.

• Impaired Sensation: Loss of sensation and coordination can lead to fear of injuries and complications, especially in the case of diabetic neuropathy.

Overall, these pathophysiological explanations highlight the intricate interplay between disease mechanisms and the psychological impact they can have, contributing to internal stress and fear in individuals dealing with these health conditions.

4. Key Differences between Normal Individuals Stress and Fears Versus Patients with Psychological Disorders Reactions and Behavior Regarding External Stimulus

Key differences between normal individuals' stress and fear responses versus those of individuals with psychological disorders include:

4.1 Intensity and Duration

• Normal Individuals: Experience stress and fear within a typical range of intensity and duration, often proportional to the external stimulus.

• Psychological Disorder Patients: May exhibit heightened intensity and prolonged duration of stress or fear responses, disproportionate to the external trigger.

4.2 Triggers and Sensitivity

• Normal Individuals: React to common stressors such as work pressure, relationship issues, or life events with a standard level of sensitivity.

• Psychological Disorder Patients: Display heightened sensitivity and may react strongly to stimuli that might be perceived as nonthreatening by others, often due to underlying conditions like anxiety disorders or PTSD.

4.3 Coping Mechanisms

• Normal Individuals: Employ adaptive coping mechanisms to manage stress and fear, such as problem-solving or seeking social support.

• Psychological Disorder Patients: Might struggle with maladaptive coping strategies, including avoidance, self-harm, or substance abuse, reflecting the challenges associated with their mental health condition.

4.4 Impact on Daily Functioning

• Normal Individuals: Experience stress and fear without significantly impairing daily functioning; they can typically navigate life despite occasional stressors.

• Psychological Disorder Patients:

• May face difficulties in daily life, as their reactions and behaviors can interfere with work, relationships, and overall well-being.

4.5 Perception of Threat

• Normal Individuals: Perceive threats realistically and respond accordingly, with a balanced evaluation of the situation.

• Psychological Disorder Patients: May perceive threats that are not objectively present or interpret stimuli in a distorted manner, contributing to exaggerated stress or fear responses.

4.6 Consistency and Predictability

• Normal Individuals: Exhibit consistent stress and fear responses that align with the nature of the stimulus.

• Psychological Disorder Patients: Responses may be inconsistent, unpredictable, or disproportionate, reflecting the impact of their mental health condition on emotional regulation.

• Understanding these differences is crucial for tailored interventions and support, recognizing that individuals with psychological disorders may require specialized strategies to manage their stress and fear responses.

Note: Based on above descriptions, the author developed his lifestyle's stress category into two different groups, stresses for normal individuals and reactions for psychological disorder patients.

5. 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.

6. 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.

7. 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).***

8. Results

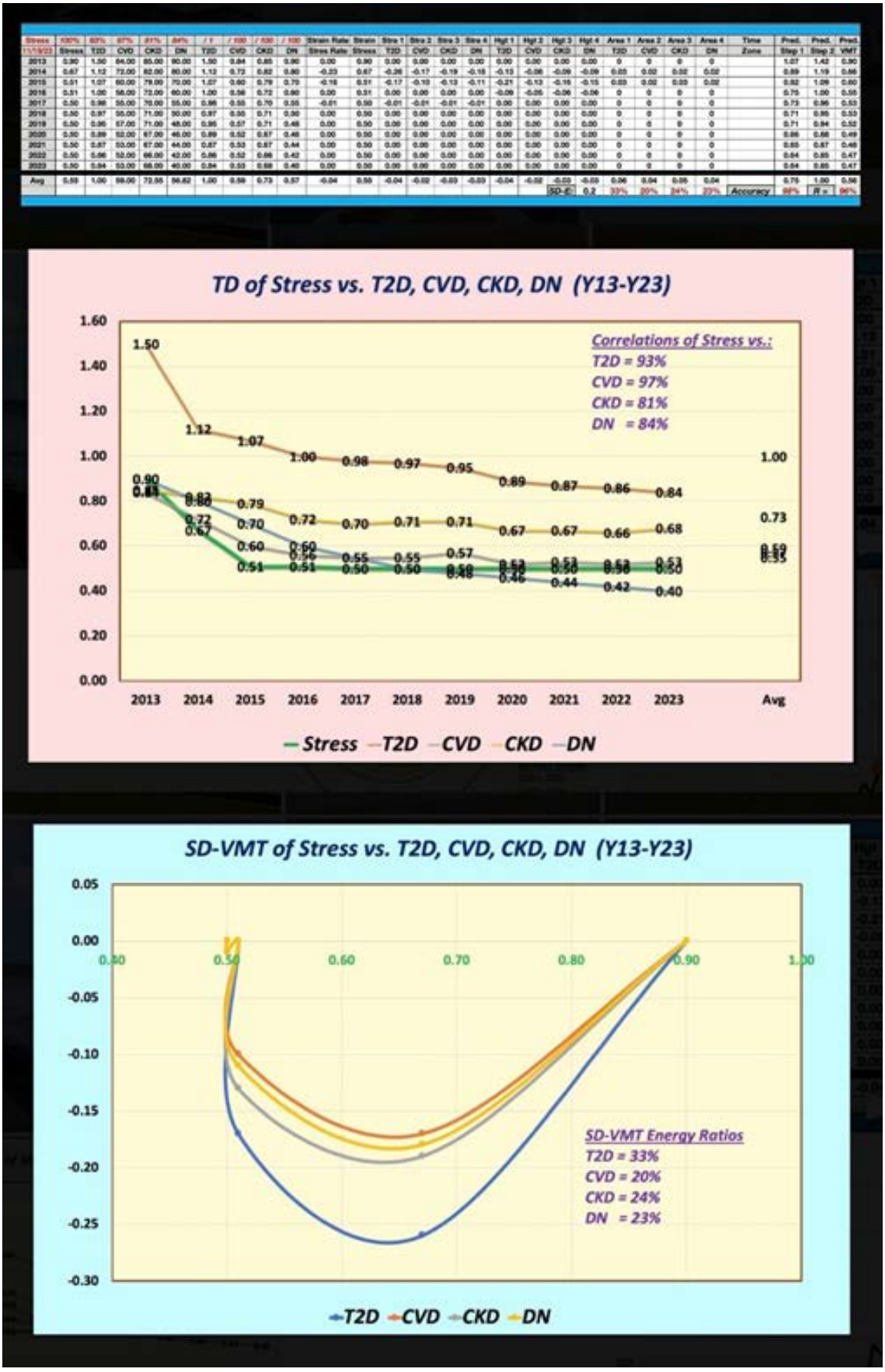

Figure 1: Time-domain Curves

9. Conclusions

In summary, traditional statistical calculations reveal correlations between his stress and his four complications:

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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.