

A clinical report on the relationships between metabolism and obesity, type 2 diabetes, cardiovascular risk by using the GH-Method: math-physical medicine

Abstract

The author developed his GH-Method: math-physical medicine (MPM) by applying mathematics, physics, engineering modeling, and computer science (big data analytics and AI) to derive the mathematical metabolism model and three prediction tools for weight, FPG, and PPG with >30 input elements. This study includes 11 categories: weight, glucose, blood pressure, lipids, food, water, exercise, sleep, stress, life pattern regularity, time with ~500 input and output elements. He collected more than 1 million "clean" data over 7 years.

Keywords: type 2 diabetes, cardiovascular risk, obesity, metabolism, metabolic conditions, chronic diseases, lifestyle data, artificial intelligence and math-physical medicine

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Abbreviations: MPM, math-physical medicine; T2D, type 2 diabetes; MI, metabolism index

Introduction

By using the GH-Method: math-physical medicine and big data on one particular patient (the author), this clinical paper utilized the results to describe the relationship between his metabolic state and medical conditions, including obesity, type 2 diabetes (T2D), and cardiovascular risk.

Method

The obese patient was diagnosed with T2D, hyperlipidemia, and hypertension over 25 years ago and suffered five cardiac episodes during 1994-2006. For this study, approximately 1.5M detailed metabolic conditions and lifestyle data (1/1/2012 - 12/31/2018) were collected and processed; advanced mathematics, physics concepts, engineering modeling, and artificial intelligence (AI) were utilized rather than following the traditional biology and chemistry approach as research tools. The author defined two new terms: Metabolism Index (MI) and General Health Status Unit (GHSU) to evaluate his

overall metabolism and associated chronic diseases.

Here are the steps to his research process:

- Observing physical phenomena and metabolic changes, collecting relevant data using software;
- Applying appropriate engineering modeling and deriving various inter-relationship mathematical equations for predictions, along with applying statistics tools for variance and sensitivity studies;
- Using machine learning and AI to predict important metabolic changes.

Results

Figure 1 displays some of his key metabolic factors and health symptoms within nine years (2010-2018). Figure 2 shows the close relationships existing between Metabolism, including MI, GHSU, and chronic diseases (2012-2018). Figure 3 demonstrates the various degree of correlations between T2D conditions and influential factors: weight, food, and exercise (2016-2018). Figure 4 illustrates the risk probability of having a heart attack (CVD) or stroke dropping significantly (2010-2017).¹⁻⁴

	2000	2010	2012	2017	2018	Note:
Metabolism						
MI & GHSU			102%	57.4%	56.6%	73.5% is "break-even" line
Lifestyle Management						
Food Quantity (% of normal portion)		112%		85%	84%	
Daily Exercise (Walking steps)		2,000		17,863	18,292	
Post-Meal Walking (steps)		500		4,440	4,570	
Obesity						
Weight (lbs)	220	210	196	174	171	took 3 years efforts
Waistline (inches)	46	44	44	33	32	took 5 years efforts
BMI	32.7	31.2	29.1	25.8	25.4	
Diabetes						
Daily Glucose (mg/dL)		279		117	116	Using glucose prediction models
A1C		10.0%		6.5%	6.5%	
Chronic Diseases						
SBP		150	127	106	106	
DBP		100	85	64	64	
Triglyceride (<150)		1161		115	85	
HDL (>40)		24		45	49	
LDL (<130)		174		99	109	
ACR (Kidney <30)		116		25	15	High ACR was the "wake-up call"
Cardiovascular Risk						5 heart episodes (1994 - 2006)
Heart Attack or Stroke (%)	74%		62%	26.4%	31%	Framingham's 2017 is 26.7%

Figure 1 Chronic diseases, including obesity, T2D, hyperlipidemia, hypertension show significant improvements when metabolism improved.

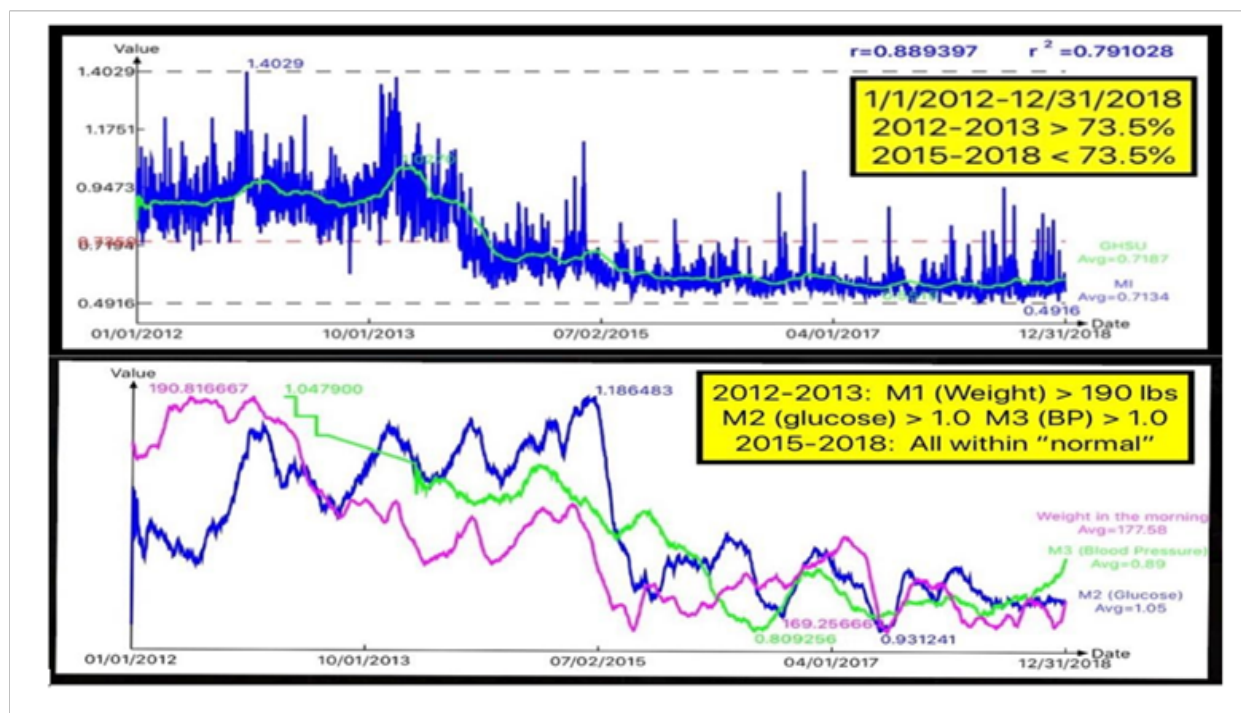


Figure 2 Relationship between Metabolism, including MI, GHSU and chronic diseases.

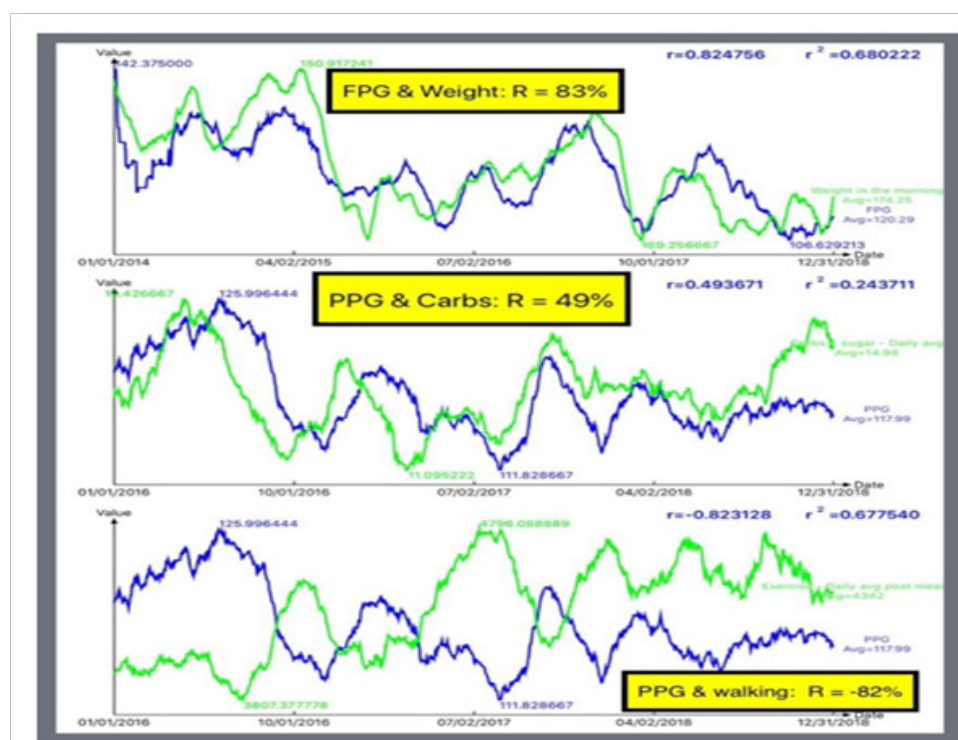


Figure 3 Relationship of T2D between weight, food, and exercise.

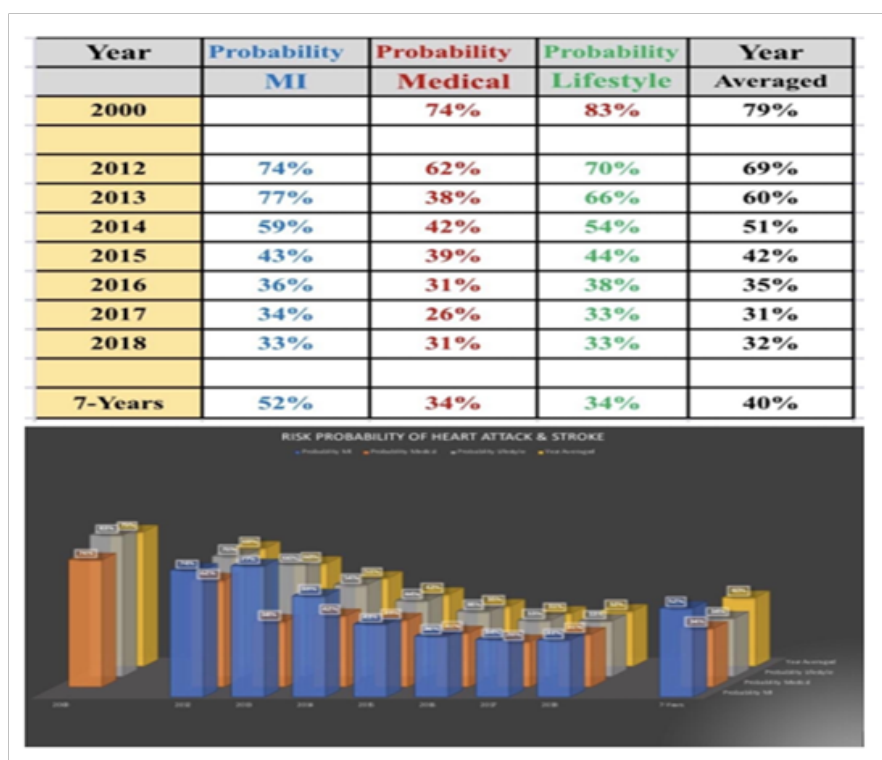


Figure 4 Risk probability of having a heart attack or stroke dropping significantly.

Conclusion

This math-physical medicine approach has quantitatively proven the close relationship between metabolic changes due to lifestyle improvement and effective chronic disease control.

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Conflicts of interest

Author declare that there is no conflict of interest.

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