Research Article

Applying Progressive Lifestyle Modifications and Biomedical Trend Analysis plus Pattern Recognition to Strengthen Metabolism and Immunity In Order To Fight Against Infectious Diseases Using GH-Method: Math-Physical Medicine (No. 330)

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Abstract

In this article, the author demonstrates his research method and analysis approach regarding metabolism and immunity. Even though he did not contract any infectious disease, including a severe flu, over the past 5 years, he decided to use his collected data from the past 10-years. He utilized glucoses and weight along with diet and exercise to address his trend pattern analysis of two chronic diseases (obesity and diabetes) and his lifestyle's progressive modification. This lifestyle modification is closely related to the subject of behavioral psychology.

He developed a research methodology including GH-Method: math-physical medicine (MPM) and Mentality-Personality Modeling (MPM) to conduct this study. He has emphasized the quantitative linkage and data precision between the disease's physiological phenomena and the lifestyle behavior's psychological influences.

Although he has chosen obesity and diabetes as two examples, he could easily convert them into a combined metabolic disorder disease or just choose an infectious disease as his z-axis element to conduct a similar analysis. As a result, he decided to focus on his metabolism and immunity as the measurement yardsticks of his body strength to fight against various infectious diseases. The research methodology and analysis approach are identical as the example studies.

Most diseases can be prevented or controlled from the deepest core area and at the most fundamental level via a lifestyle management program. Once lifestyle details improve, then the patient's overall metabolism situation will be healthier. Of course, when metabolic disorder conditions are under control via lifestyle improvements, then the immune system is also strengthened since metabolism and immunity are two sides of the same coin. This means that "a coin may have different graphics designs on each side (similar to different biomarker readings), but they share the same internal material (similar to the same body and organs)". This strong immunity will become the most effective defense force of the patient's body to fight against many infectious diseases.

In this study, the author developed a geometric presentation model using some key lifestyle details, such as carbs/sugar intake amount and meal portion percentage as the x-axis, whereas the post-meal and daily total walking steps are the y-axis. Next, he selected some important biomarkers, such as daily glucose and daily body weight as the z-axis values and then "fold-over" or "crush -down" the z-axis to superimpose with the x-y planar space with a special format of "radio waves".

He also applied the same approach and the radio-wave presentation diagram for his study of metabolism and immunity. Under his created 3D presentation on a 2D planar space, the moving trends and recognized patterns of the combined metabolism and immunity scores become ultra-clear. These values on the planar x- and y-axes space are a representation of his progressive lifestyle behavioral modifications over the past 10 years, while the z-axis values are a representation of his general ability that is metabolism and immunity, to fight against diseases, including infectious ones.

Although he has chosen obesity and diabetes as two illustration examples, he could easily convert them into a combined metabolic disorder disease or just choose an infectious disease as his z-axis element to conduct a similar analysis. Finally,

he decided to focus on his combined metabolism and immunity as the measurement yardstick of his body strength to fight against various infectious diseases. The research methodology and analysis approach are identical as the provided example studies.

In summary, as shown in Figure 5, the combined metabolism and immunity values (gray stars) moves from the upper-right corner (110%) with a 45-degree angle toward the bottom-left direction. Except in 2013, when he was very unhealthy, the moving path has a slight upward trend; otherwise, the moving path followed a 45-degree straight line downwards to the bottom-left corner of 54% for metabolism and 53% for immunity. This conclusive figure demonstrated that his persistent efforts on controlling his medical conditions via a stringent lifestyle management program has ultimately made his metabolism and immunity stronger year after year.

This report also exhibited his strong determination, willpower, and persistence along with his continuous struggle on maintaining his healthy levels of diet, exercise, metabolism for over the past 10 years. The only driving force behind him is that he wants to have a long, healthy life and not suffer from the dreadful chronic diseases, cancers, and various infectious diseases.

When his MI and GHSU values reached to the *Turing Year of 2014,* his metabolism situation became much better compared to his previous years, and his immunity was getting stronger as a result. He has not gotten the flu or any serious infectious diseases since the year 2016.

Through analyzing those distinctive trend patterns, the personality traits and psychological behavioral characteristics of a patient can be revealed instantly and clearly. Consequently, a more practical guidance of "progressive behavioral modification" can be provided to other patients in order to improve their medical physiological conditions by strengthening their metabolism and immunity.

Introduction

In this article, the author demonstrates his research method and analysis approach regarding metabolism and immunity. Even though he did not contract any infectious disease, including a severe flu, over the past 5 years, he decided to use his collected data from the past 10-years. He utilized glucoses and weight along with diet and exercise to address his trend pattern analysis of two chronic diseases (obesity and diabetes) and his lifestyle's progressive modification. This lifestyle modification is closely related to the subject of behavioral psychology.

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Although he has chosen obesity and diabetes as two examples, he could easily convert them into a combined metabolic disorder disease or just choose an infectious disease as his z-axis element to conduct a similar analysis. As a result, he decided to focus on his metabolism and immunity as the measurement yardstick of his body strength to fight against various infectious diseases. The research methodology and analysis approach are identical as the example studies.

Method
Background

To learn more about the GH-Method: math-physical medicine (MPM) research methodology, readers can review his article in Reference 1, *"Biomedical research methodology based on GH-Method: math-physical medicine (No. 310)",* to understand his MPM analysis method.

Obesity and Diabetes Research

The author learned the following biomedical inter-relationships between cause/reason and consequence/result from top to bottom:

• Poor Lifestyle management
• Metabolic disorder
• Obesity
• Chronic diseases
• Complication diseases
• Weak Immunity
• Various diseases lead to death

His first priority was to focus on learning both lifestyle and metabolism before dealing with his obesity and diabetes issues.

He was diagnosed with severe type 2 diabetes (T2D) in 1995 and then developed many serious complications, including CVD, CKD, foot ulcer, diabetic retinopathy, hypothyroidism, bladder infection, and others that became life-threatening by 2010. During that year, his weight also reached to 220 lbs. with a BMI of 32.5, and he had suffered three cardiac episodes. Therefore, he decided to self-study chronic diseases, such as obesity, diabetes, hypertension, hyperlipidemia, cardiovascular diseases, stroke, as well as food nutrition, in order to save his own life. Food is probably the most significant and complicated input element to influence the chronic diseases that are mentioned above.

After the first 4 years of studying endocrinology, he then spent the entire year of 2014 to develop a complex mathematical model of metabolism. This model contains four easily available biomarkers of medical conditions such as body weight, glucose, blood pressure, and lipids, along with six lifestyle details including food portion quantity & nutritional quality balance, water intake, appropriate exercise, sleep amount & quality, stress reduction, and daily life routine regularity. He applied the concept of topology from mathematics and the modeling technique of finite element method from engineering to develop this mathematical model of metabolism which became the cornerstone of his future medical research work. As a result, his overall health conditions started to improve after 2015.

In 2014, he also defined two specific output parameters of his metabolism model as metabolism index (MI) and general health status unit (GHSU). MI is the combined score of the four medical conditions and six lifestyle details which can be calculated on one specific day, a time instant, or over a period of time. GHSU is defined as the 90-days moving average MI values. Since GHSU describes the metabolism conditions over a 90-day period, it can be used as a key measurement tool for the baseline measurement of general health status of health. Therefore, *GHSU can also serve as a measuring unit for the general condition and requirement of the human body's immune system, which is the defense force against various diseases, including infectious diseases.*

The author has proved that postprandial plasma glucose (PPG) contributes about 75% to 80% towards HbA1C formation and fasting plasma glucose (FPG) contributes about 20% to 25% of HbA1C formation.

In addition, in 2015, he has identified at least 19 influential factors associated with the PPG formation. Among those 19 influential factors, carbs/sugar intake amount in food and meal would provide ~38% and post-meal walking exercise would contribute ~41%. Combining these two primary influential factors, it gives ~80% contributions of the PPG formation.

From 2016 to 2017, he identified 5 contributing factors of FPG formation. He also discovered a solid statistical connection between his FPG and his body weight with a ~90% correlation coefficient.

A fairly detailed explanation of his weight and glucose research is provided because they are interwoven together and are based on lifestyle management, leading to metabolism balance. Similarly, lifestyle and metabolism are also the two primary factors or root causes for immunity strength in order to fight against infectious diseases.

Glucose and Weight Trend Pattern Diagram

The author has collected a total of two million data of his medical conditions and lifestyle details for the past 10 years from 2010 to 2020. In this study, he only utilized 3 subsets including 6 categories from his collected and stored big database, such as: (1) body weight and finger-piercing measured glucoses; (2) carbs/sugar intake amount and meal portion percentage; and (3) post-meal walking steps and daily walking steps.

In order to demonstrate the results of his *glucose and weight trend pattern diagrams*, he created a modified two-dimensional (2D) planar space which can describe a three-dimensional (3D) data and information. Initially, he set his x-coordinate as his carbs/sugar intake amount and his meal portion percentage from low scale to high scale with the following 5 segments:

• Segment A: 0-10 grams / 60-70 %
• Segment B: 10-20 grams / 70-80 %
• Segment C: 20-30 grams / 80-90 %
• Segment D: 30-40 grams / 90-100 %
• Segment E: 40-50 grams / 100-110 %

Secondly, he set his y-coordinate as his post-meal walking steps and daily walking steps from high scale to low scale with the following 5 segments:

• Segment 1: 4-5k / 16-20k steps
• Segment 2: 3-4k / 12-16k steps
• Segment 3: 2-3k / 8-12k steps
• Segment 4: 1-2k / 4-8k steps
• Segment 5: 0-1k / 0-4K steps

Therefore, these x-axis and y-axis constitute a 2D planar space with a total of 25 sub-regions inside, such as A1 through E5 in Figures 3 and 5.

Thirdly, he sets his "pseudo" z-coordinate" as his daily glucose & daily weight levels from low scale (lower left corner) to high scale (upper right corner) in a "radio-wave" format with the following 6 segments:

• Segment 1: 100-130 mg/dL & 170-175 lbs.
• Segment 2: 130-160 mg/dL & 175-180 lbs.
• Segment 3: 160-190 mg/dL & 180-185 lbs.
• Segment 4: 190-220 mg/dL & 185-190 lbs.
• Segment 5: 220-250 mg/dL & 190-200 lbs.
• Segment 6: 250-280 mg/dL & 200-210 lbs.

However, for a better view, he superimposes ("fold-over" or "crush-down") this z-axis on his 2D planar x-y space with a "radio-wave" format to show their different levels of glucoses and weights (Figure 3). In this created presentation diagram, the reader of this article can easily observe the glucose and weight trend patterns from 2010 to 2020 and their respective relationship with food and exercise.

From observing this glucose and weight trend pattern diagrams, patients can modify their behavior one step at a time, by taking little steps on a smaller scale. This is what the author defined as a progressive behavioral modification.

Behavioral Psychology

On August 28th, 2018, Dr. Bryn Farnsworth stated that, "Behavioral psychology is the study of how our behaviors relate to our mind – it looks at our behavior through the lens of psychology and draws a link between the two."

FPM is an editorially independent, peer-reviewed journal pub-

lished by the American Academy of family physicians. Here is an excerpt from the March-April 2018 edition [10].

"Using these brief interventions, you can help your patients make healthy behavior changes"

Effectively encouraging patients to change their health behavior is a critical skill for primary care physicians. Modifiable health behaviors contribute to an estimated 40 percent of deaths in the United States (note: the author's estimate is close to 50%). Tobacco use, poor diet, physical inactivity, poor sleep, poor adherence to medication, and similar behaviors are prevalent and can diminish the quality and length of patients' lives. Research has found an inverse relationship between the risk of all-cause mortality and the number of healthy lifestyle behaviors a patient follows.

From the articles in References 10 to 13, we can see the close relationship between overall health and lifestyle behavioral psychology.

The author believes that the behavioral psychological factor is also important for patients who want to build up a strong immunity to fight against infectious diseases, such as COVID-19. In addition, being different from the medication's biochemical intervention, any lifestyle/behavioral modifications and metabolism/immunity strengthening process take a greater amount of effort and longer period of time. However, its effectiveness and influences are also long lasting in comparison with medications.

Results
In Figure 1, it shows the background data table for glucoses and weights that contain five values for glucose control such as daily glucose, FPG, PPG, carbs/sugar intake amount in grams, and post-meal walking exercise per 100 steps along with three values for weight control such as daily weight, meal portion percentage, and daily walking steps.

	Daily Glucose	FPG	PPG	Carbs/Sugar (g)	PM Walk (/100)
Y2010	250	160	280	68	4
Y2011	200	150	220	41	8
Y2012	170	140	180	25	12
Y2013	145	135	148	16	30
Y2014	135	127	137	15	34
Y2015	129	124	130	14	37
Y2016	119	117	120	15	41
Y2017	117	120	117	14	44
Y2018	116	114	117	15	45
Y2019	114	115	114	13	40
Y2020	110	107	110	13	44

	Weight	Meal Portion %	Daily Walk (/100)
Y2010	220	114	12
Y2011	198	100	30
Y2012	189	95	40
Y2013	183	93	76
Y2014	177	90	118
Y2015	175	89	150
Y2016	173	88	170
Y2017	174	85	179
Y2018	171	84	185
Y2019	173	76	157
Y2020	172	68	162

Figure 1: Background data tables of both glucose and weight control

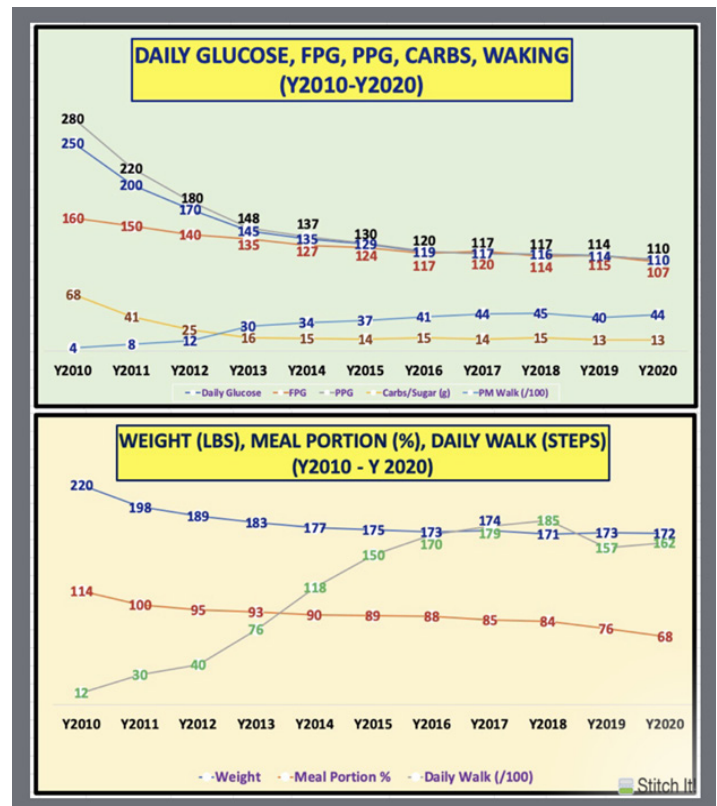Figure 2 depicts line charts for both glucoses and weights over the past 10 years.

Figure 2: Line charts of both glucose and weight

Glucose Reduction
The author started with his daily glucose at 250 mg/dL (PPG at 280 mg/dL) in 2010, moving forward to a lower daily glucose at 129 mg/dL in 2015 (PPG at 130 mg/dL), and finally reached 110 mg/dL in 2020 (PPG at 110 mg/dL). The bottom two curves of "decreasing" carbs/sugar and "increasing" post-meal walking steps demonstrate their significant influences on his daily glucose and PPG. He decreased his carbs/sugar intake amount from 68 grams per meal in 2010 down to 13 grams per meal in 2020. During the same 10-year period, he increased his post-meal walking exercise from 400 steps per meal in 2010 up to 4,400 steps per meal in 2020.

Weight Reduction
His body weight and meal portion percentage move in unison with a high positive correlation coefficient (+88%), while body weight and daily walking steps move in opposite directions with a high negative correlation coefficient (-89%). The author started with his weight at 220 lbs. in 2010, moving forward to a lower daily glucose at 175 lbs. in 2015, and finally reached 169 lbs. in September of 2020. At the same time, he reduced his meal portion percentage from 114% per meal in 2010 down to 68% per meal in 2020. In addition, he increased his daily walking exercise from 1,200 steps per day in 2010 up to 18,500 steps per day starting in 2018.

Glucose and Weight Trend Pattern Diagrams
Figure 3 illustrates his created presentation diagrams of 3D "ra-

dio-wave" data format on a 2D planar space. These two diagrams actually depict his *glucose and weight trend pattern analyses* with his lifestyle behavioral modifications together.
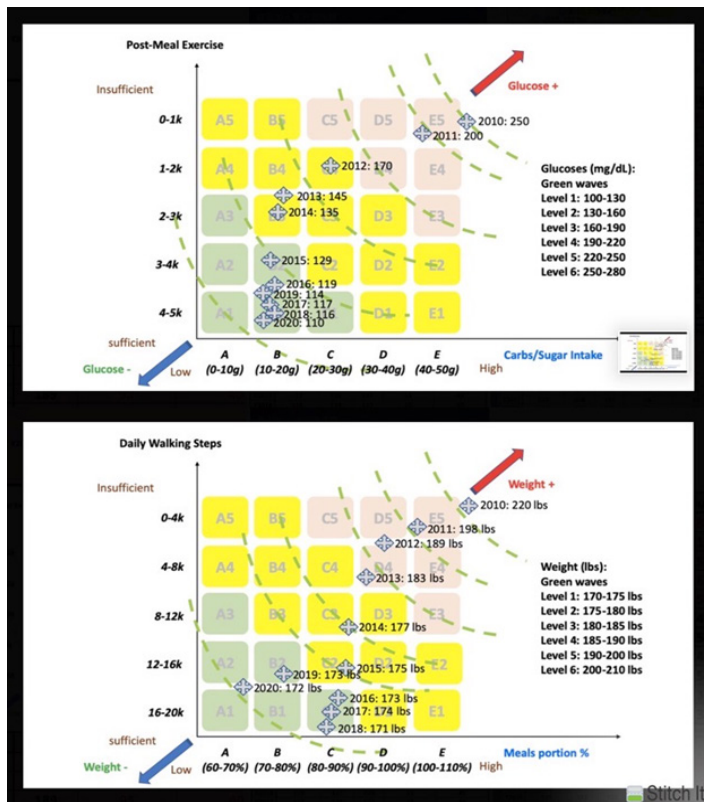

Figure 3: Trend & Pattern diagrams of both glucose and weight control

His daily glucoses, represented with the gray "star" symbols on the pseudo z-axis radio-wave space, starts from the upper-right corner of 250 mg/dL at 2010, moving toward the lower-left direction with a ~30 degree downhill slope, after acquiring correct knowledge and being persistent with his diet and exercise regimen. Despite his medication reduction process over this time frame of three years (2013-2015), his daily glucoses are further decreased from 145 mg/dL in 2013 to 129 mg/dL in 2015. From 2015 to 2019, he mainly focused on increasing his post-meal walking exercise from ~3,300 steps to 4,400 steps. As a result, his daily glucoses dropped "straight downward" to the lower left corner of this planar space like a free-falling object. Finally, he reached average glucose (and PPG) of 110 mg/dL in 2020 (from 1/1/2020 to 8/6/2020).

His daily body weight, also represented with the gray "star" symbols on the pseudo z-axis data, starts from the upper-right corner of 220 lbs. in 2010 (subregion E5), moving toward the lower-left direction with a ~45 degree downhill slope until 189 lbs. in 2012 (subregion D4), and then dropping "straight downward" like a free-falling object until his weight reached 171 lbs. in 2018 (subregion A3).

All of these accomplishments occurred after acquiring correct

knowledge and being persistent with his diet and exercise regimen. It is not an easy task to reduce one's carbs/sugar intake from 68 grams down to 13 grams, decrease food intake portion from 114% down to 68%, along with maintaining post-meal walking exercise of ~4,300 steps at a frequency of three times a day and daily walking over 16,000 steps (11 km or 7 miles per day) for many years. It definitely requires extraordinarily strong determination, willpower, and persistence for an individual to maintain this behavior for 8+ years.

Metabolism and Immunity

Currently, he can apply the methodology described from above to "combat obesity and diabetes via diet and exercise" and extend it to his problem at hand, "fighting against infectious diseases via strengthening his metabolism and immunity".

Initially, he calculates his annualized MI and GHSU values from 2010 through 2020. The results are shown in Figure 4 in the format of data table and bar chart. It is oblivious that both of his metabolism index MI and GHSU (as an indicator for body's general immunity strength) are decreasing year after year and finally reached to a pretty low level between 53% and 59% (means healthy) from 2016 to 2020. This means that both of his metabolism and immunity have become strong during the period of 2016 to 2020; therefore, he has not contracted any infectious disease since 2016.
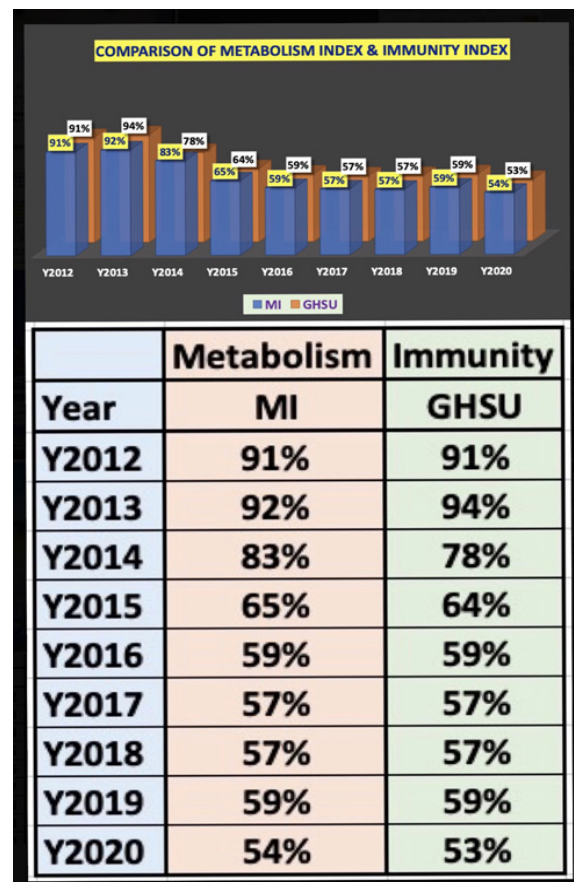

Year	Metabolism MI	Immunity GHSU
Y2012	91%	91%
Y2013	92%	94%
Y2014	83%	78%
Y2015	65%	64%
Y2016	59%	59%
Y2017	57%	57%
Y2018	57%	57%
Y2019	59%	59%
Y2020	54%	53%

Figure 4 : Data table and bar charts of both MI and GHSU

In Figure 5, it reflects a conclusive and interesting diagram that applied the exact same "pseudo" 3D space on a 2D planar space with z-axis (a combined metabolism and immunity strength) expressed via a radio-wave format similar to above examples of obesity and diabetes. The combined metabolism and immunity values (gray stars) move from the upper-right corner (110%) with a 45-degree angle toward the bottom-left direction. Except in 2013, when he was very unhealthy, the moving path has a slightly upward trend; otherwise, the moving path follows a 45-degree straight line towards the bottom-left corner of 54% for metabolism and 53% for immunity. This conclusive figure has demonstrated that his persistent efforts on controlling his medical conditions via a stringent lifestyle management program has made his metabolism and immunity to become stronger (lower value) year after year.
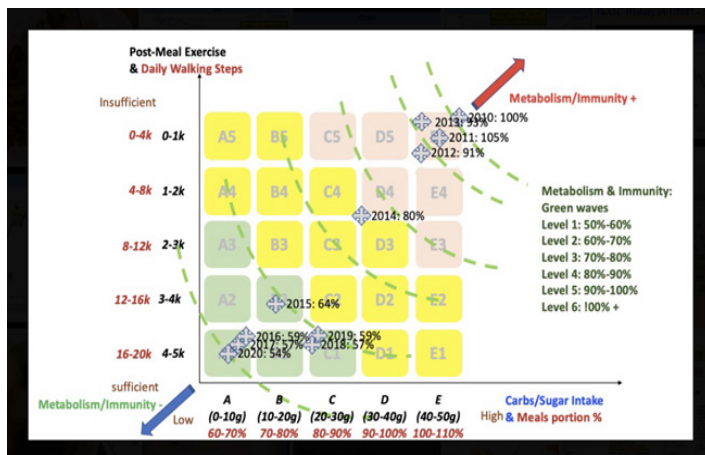

Figure 5: Trend & Pattern diagrams of both metabolism and immunity

The author has implemented these techniques successfully. In the process, he saved his own life from the life-threatening complications of diabetes, such as experiencing five cardiovascular episodes and renal difficulties. In Figure 3, we can see clearly that these lifestyle behavioral modification finally paid off in the long run and we can see the overall benefit he is getting from his strengthened metabolism and immunity in Figure 5.

There is nothing better than living a healthier and longer life via a better metabolism and stronger immunity to fight against chronic diseases and their complications (50% of death cases), cancers (29% of death cases), and infectious diseases (11% of death cases).

Conclusion

Most diseases can be prevented or controlled from the deepest core area and at the most fundamental level via a lifestyle management program. Once lifestyle details improve, then the patient's overall metabolism situation will be healthier. Of course, when metabolic disorder conditions are under control via lifestyle improvements, then the immune system is also strengthened since metabolism and immunity are two sides of the same coin. This means that "a coin may have different graphics designs on each side (similar to different biomarker readings), but they share the same internal material (similar to the same body and organs)". This strong immunity will become the most effective defense force of the patient's body to fight against many infectious diseases.

In this study, the author developed a geometric presentation model using some key lifestyle details, such as carbs/sugar intake amount and meal portion percentage as the x-axis, whereas the post-meal and daily total walking steps are the y-axis. Next, he selected some important biomarkers, such as daily glucose and daily body weight as the z-axis values and then "fold-over" or "crush -down" the z-axis to superimpose with the x-y planar space with a special format of "radio waves".

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Through analyzing those distinctive trend patterns, the personality traits and psychological behavioral characteristics of a patient can

be revealed instantly and clearly. Consequently, a more practical guidance of "progressive behavioral modification" can be provided to other patients in order to improve their medical physiological conditions by strengthening their metabolism and immunity [1-15].

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