

Detailed Lifestyle Comparison Study Between Pre-COVID-19 and COVID-19 Periods Using GH-Method: Math-Physical Medicine (No. 322)

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ABSTRACT

The author utilizes big data based on lifestyle details to quantitatively compare the differences between two periods: pre-COVID-19, from 5/5/2018 to 1/18/2020, and COVID-19, from 1/19/2020 to 8/29/2020.

The “Comparison of 6 lifestyle categories during 2 periods” is the most important and conclusive chart because it shows the direct comparison of lifestyle category scores using bar charts. The first observation is that all scores are below the break-even line of 73.5% which means healthy lifestyle has been maintained during these two periods. The second observation is that, while exercise and stress categories have the same scores, all of the other four lifestyle categories (water intake, sleep, food/meal, and daily life routine) have lower scores during COVID-19 compared to the scores of pre-COVID-19.

The COVID-19 virus is the worst epidemic in recent human history in terms of its spreading speed, fatality number, and emotional impact on the world population. People belonging to the “vulnerable” groups, such as the elderly with medical history or existing chronic diseases and complications, require special consideration to their health conditions as well as lifestyle management program during this period. However, the author, who is 73-year-old, achieved even better results on his diabetes conditions and overall health control in terms of weight, blood pressure, glucose, and HbA1C values. The knowledge and experience he acquired in the past 10 years of medical research and his developed mathematical metabolism model, especially the portion of lifestyle management program, have assisted him in many ways. More importantly, the quiet, stable, and undisturbed lifestyle during this quarantined period contributes to his better medical conditions control and lower lifestyle performance values. In fact, he has turned the COVID-19 crisis into his health advantage!

Keywords: COVID-19, HbA1C values, MPM analysis

INTRODUCTION

The author utilizes big data based on lifestyle details to quantitatively compare the differences between two periods: pre-COVID-19, from 5/5/2018 to 1/18/2020, and COVID-19, from 1/19/2020 to 8/29/2020.

METHODS

Background

To learn more about the GH-Method: Math-physical medicine (MPM) methodology, readers can review the article to understand his MPM analysis method [1], along with the outlined history of his personalized diabetes research and application tools development [2].

Diabetes research

In 2014, the author applied topology concept of mathematics, and finite-element technique of engineering, to develop a ten-dimensional complex mathematical model of metabolism. The metabolism model consists of four

biomarker output categories such as weight, glucose, blood pressure, lipids, along with other lab-tested data (ACR, TSH, and others), and six lifestyle input categories such as food/meal, water intake, exercise, sleep, stress, and daily life routines. These ten categories further contain approximately 500 detailed elements [3]. He further defined two new parameters, metabolism index (MI), as the combined score of the above 10 metabolism categories and 500 detailed elements, and general health status unit (GHSU), as the 90-days moving average value of MI. Please note that Mi

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(where $i = 1$ through 10) represents individual metabolism score of each category. Since the development of this metabolism model took almost three years, he has defined the different break-even levels for separate categories. However, the break-even line for the overall metabolism parameters, both MI and GHSU, is 0.735 or 73.5%. When the parameter is 73.5% or above is unhealthy, whereas below 73.5% is healthy.

Since 1/1/2012, he has collected ~2 million data of his own biomedical conditions and personal lifestyle details. He has only utilized a part of his past 10-years 'big database for analysis in this article.

As a result of conducting his 10-years diabetes research efforts and using his developed mathematical metabolism model, his health condition improvements are in a format (Y2010 vs. Y2020) as follows:

Weight (lbs.): 220 vs. 171

Waistline (inch): 44 vs. 33

Daily glucose (mg/dL): 280 vs. 110

HbA1C (%): 10 vs. ~6.3

In 2017, he already achieved excellent results on all fronts, especially his glucose control. However, during 2018 and

2019, overlapping with the pre-COVID-19 period, he traveled to 50+ international cities to attend 60+ medical conferences and made ~120 oral presentations. The hectic schedule inflicted damage to his diabetes control and overall metabolism, through dinning out along with exercise disruption, and irregular life routines through traveling.

On 1/19/2020, he started his self-quarantine life, living a regular, quiet, and routine lifestyle. He eats home-cooked meals, maintains his daily routine exercise with a consistent sleep pattern. As a result, during the COVID-19 period, he reached his "best performance period" in his past 25 years of diabetes history. In a summarized biomarker near the end of August 2020, his weight is 170 lbs., waistline is 33 inches, glucose is 105 mg/dL, HbA1C is 6.0%, and SBP/DBP/HR are 108/58/57. It is obvious that his overall lifestyle during COVID-19 period has provided a solid foundation in achieving his excellent health and medical conditions. For this reason, he decided to write a special article which focuses on his lifestyle details [4].

RESULTS

In **Table 1**, it shows the background data table of both lifestyle category scores and lifestyle details data during two periods.

Table 1. Summary data table.

	5/5/18-1/18/20	1/19/20-8/29/20	(Virus-Pre-Virus)
Lifestyle Categories	Pre-Virus Period	Virus Period	Improvements
M5 (Exercise) Score	0.6560	0.6559	-0.0001
M6 (Water) Score	0.7229	0.7040	-0.0189
M7 (Sleep) Score	0.6261	0.5965	-0.0296
M8 (Stress) Score	0.5049	0.5000	-0.0049
M9 (Food & Meal) Score	0.6470	0.5887	-0.0583
M10 (Daily Life Routine) Score	0.7443	0.7002	-0.0441
	5/5/18-1/18/20	1/19/20-8/29/20	(Virus-Pre-Virus)
M5 (Walking) Steps	15,244	15,246	2
M6 (Water) cc (best 3000 cc)	2,927	2,984	57
M7-Sleep Hours (best 8 hrs)	6.9	7.3	0.4
M7-Wake-ups from Sleep	1.3	1.3	0.0
M7-Sleep Hours (best 8 hrs)	86%	92%	6%
M7-Wake-ups from Sleep	79%	77%	-2%
M9 (Food & Meal) Quantity	79%	68%	-11%
M9 (Food & Meal) Quality	99%	100%	1%
Bowel Movement	64%	68%	4%
Weather Temperature (Degree F)	74.41	70.86	(4)

The most important and conclusive chart is shown in **Figure 1**, the direct comparison of lifestyle category scores between two periods, using bar charts. The first observation is that all scores are below the break-even line of 73.5%, which means a healthy lifestyle has been maintained during these two periods. The second observation is that, while the exercise and stress categories have the same scores, all of the other four lifestyle categories (water intake, sleep, food/meal, and

daily life routine) have lower scores during COVID-19 when compared to the scores of pre-COVID-19.

In **Table 2**, it depicts a table of lifestyle performance numbers instead of using the format of MI scores in **Table 1**.

In **Figure 2**, it illustrates the background lifestyle curves of all the lifestyle category scores and lifestyle detail numbers.

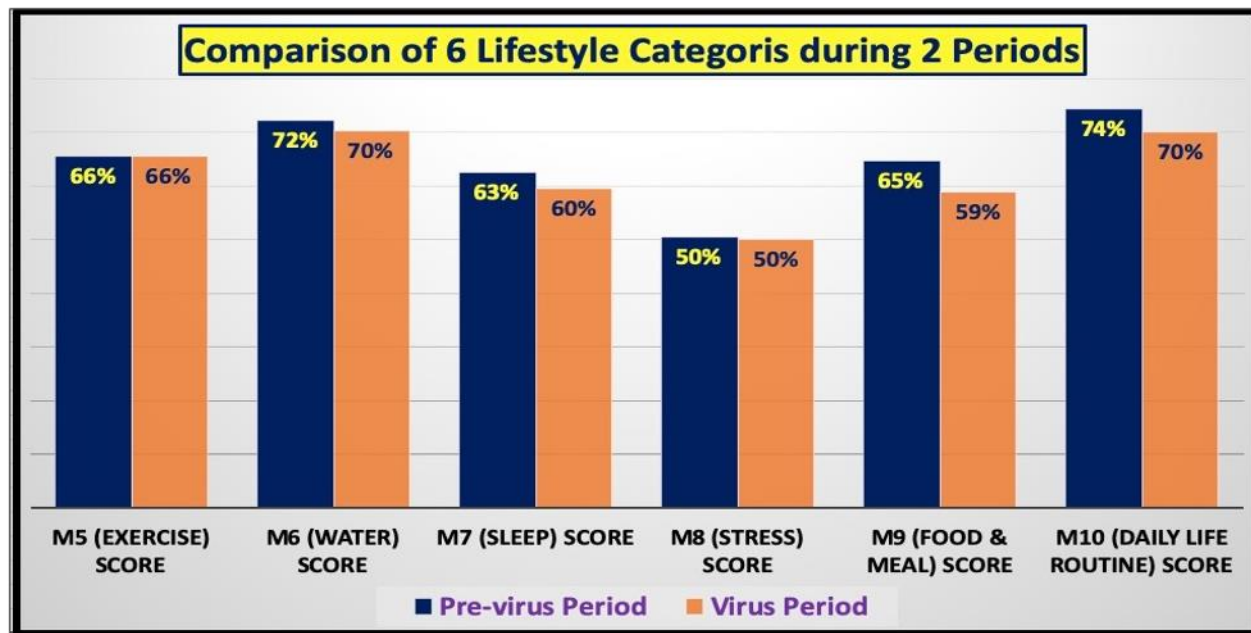


Figure 1. Comparison of Lifestyle category scores between two periods.

Table 2. Comparison of lifestyle detail numbers between two periods.

	5/5/18-1/18/20	1/19/20-8/29/20	(Virus-Pre-Virus)
Lifestyle Details	Pre-Virus Period	Virus Period	Improvements
M5 (Walking) Steps	15,244	15,246	2
M6 (Water) cc (best 3000 cc)	2,927	2,984	57
M7-Sleep Hours (best 8 h)	6.9	7.3	0.4
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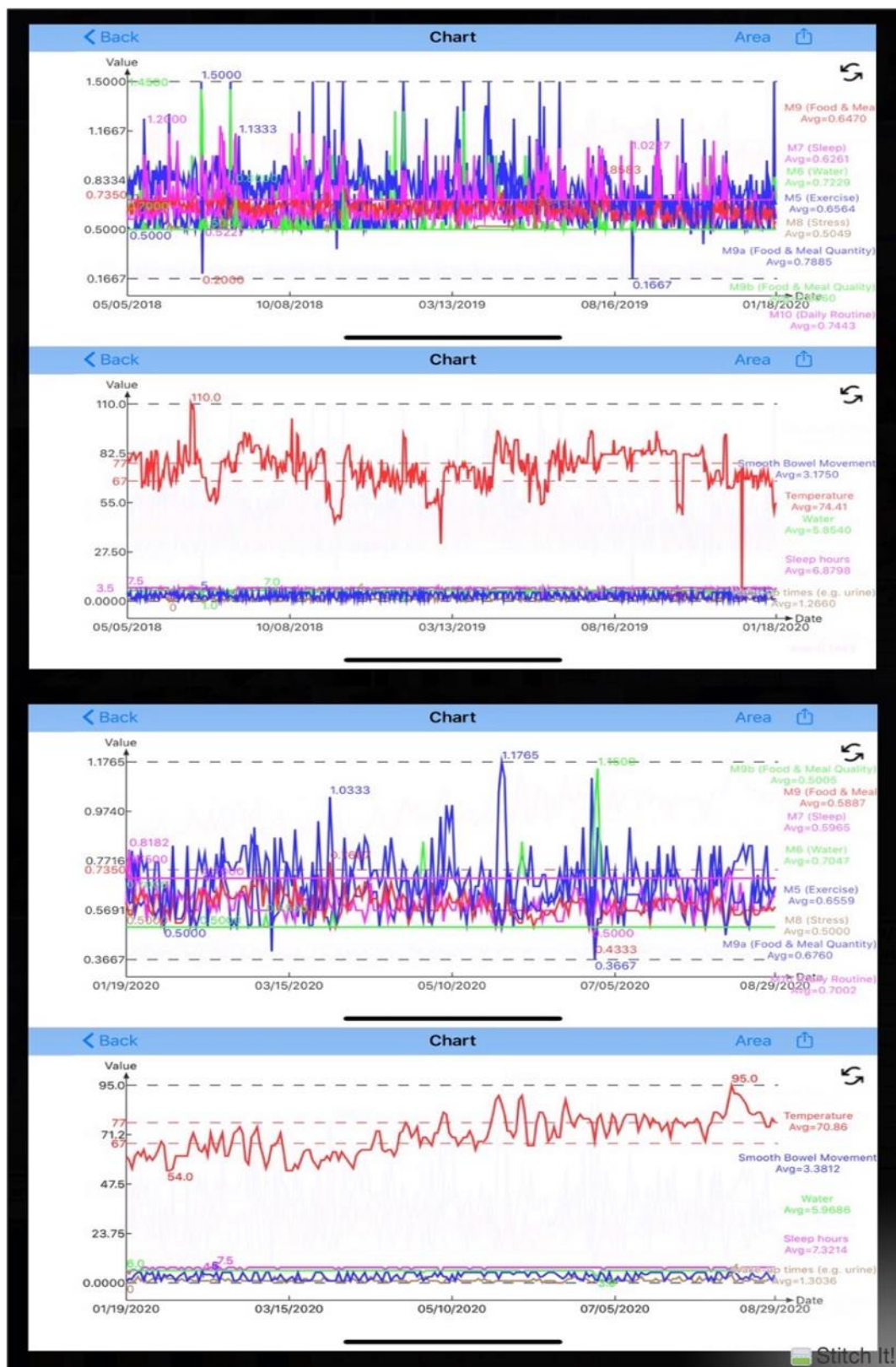


Figure 2. Lifestyle Score Curves.

The following section lists the key findings of 6 lifestyle categories for these two periods.

1. m5 of exercise: Daily walking steps are approximately the same, around 15,245 steps.
2. m6 of water intake: Daily water intake amounts are almost the same, nearly 3,000 cc.
3. m7 of sleep (**Figure 3**): He slept 6.9 hours and woke up 1.3 times each night during pre-COVID-19; and slept 7.3 h and woke up 1.3 times each night during COVID-19. He had good sleep quality for both periods, except he slept 0.4 h (24 min) longer during the COVID-19.
4. m8 of stress: He has lived a stress-free life since 2015; therefore, his stress scores for both periods were near perfect with a score of 50%.
5. m9 of food & meal: His meal quantity was reduced from 79% of his normal portion during pre-COVID-19 to 68% of his normal portion during COVID-19. The reduced food portion is the main factor of his weight reduction. In addition, he has maintained a “high food quality” (nearly 100%), for both periods. This high-food quality means that his meals are well balanced in nutritional requirements, low carbs/sugar contents, high quality proteins, while avoiding red-meat and processed food, and eating mainly vegetables high in fiber.
6. m10 of daily life routine in (**Figure 3**): He follows the stringent regulations he established in 2015. The most prominent factor during COVID-19 is that he did not travel at all due to quarantine.

The figure displays two sample screens from a mobile application. The top screen shows the 'Daily Routine' tab, which lists various activities with 'Yes' and 'No' buttons. The bottom screen shows the 'Sleep' tab, which includes a 'Common sleep items' section with a 'Reset' button and a list of sleep-related questions with rating options (1-5).

Activity	Yes	No
Short Air Travel Today	Yes	No
Long Air Travel Today	Yes	No
Trauma Today	Yes	No
Job & Work	Yes	No
Rest & Leisure	Yes	No
Exercise & Fitness	Yes	No
Food & Meal	Yes	No
Disease, Discomfort, Fatigue	Yes	No
Hay Fever & Allergy	Yes	No
Weather & Living Environment	Yes	No
Jet Lag	Yes	No
Sleep Pattern Disturbance	Yes	No
Urination & Bowel Movement	Yes	No
Brain Exercise	Yes	No
Meditation	Yes	No

Sleep Section:

Common sleep items

Select related items & provide sleep score

Annoying issues before or during sleep

1 2 3 4 5

Sleep hours

>7 6-7 5-6 4-5 <4

Wake-up times (e.g. urine)

0 1 2 3 ≥4

Degree of freshness & restfulness

1 2 3 4 5

Degree of wake-up headache

1 2 3 4 5

Degree of dreams

1 2 3 4 5

Degree of environmental comfort

1 2 3 4 5

Degree of physical sickness

1 2 3 4 5

Degree of Sleep Pattern Disturbance

1 2 3 4 5

Figure 3. Sample screens of daily life routine and sleep.

Other two observations are weather and bowel movement: First, the ambient weather temperature is the secondary influential factor of glucose formation, for both FPG and PPG. In the pre-COVID-19 period, the average temperature in the area was 74 degrees Fahrenheit, whereas during COVID-19, the average temperature is 72 degrees Fahrenheit. The temperature difference is only 2 degrees Fahrenheit. Second, his bowel movement conditions were 64% during pre-COVID-19 and 68% during COVID-19. A 100% bowel movement indicates his previous routine bowel movement condition prior to 2017. This data is mediocre

due to his senior age with slower gastrointestinal function and his food quantity reduction (from 100% to 68%) for controlling his body weight [5,6].

CONCLUSION

The COVID-19 virus is the worst epidemic in recent human history in terms of its spreading speed, fatality number, and emotional impact on the world population. People belonging to the “vulnerable” groups, such as the elderly with medical history or existing chronic diseases and complications,

require special consideration to their health conditions as well as lifestyle management program during this period. However, the author, who is 73-year-old, achieved even better results on his diabetes conditions and overall health control in terms of weight, blood pressure, glucose, and HbA1C values. The knowledge and experience he acquired in the past 10 years of medical research and his developed mathematical metabolism model, especially the portion of lifestyle management program, have assisted him in many ways. More importantly, the quiet, stable, and undisturbed lifestyle during this quarantined period contributes to his better medical conditions control and lower lifestyle performance values. In fact, he has turned the COVID-19 crisis into his health advantage!

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