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Research Article

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Comparison of effective health ages between the sophisticated model for researchers and simplified model for patients using GH-Method: math-physical medicine (No. 323)

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Abstract

This is the fourth article the author has written regarding the subject of effective health age ("Health Age") related to the medical branch of geriatrics. Originally, he used his metabolism indexes data which were collected and processed via a sophisticated software for researchers. Later, he developed a simplified APP on the iPhone for other patients. This specific article discusses the differences of health input data and output results based on metabolism indexes and estimated health ages between these two different software versions.

A comparison study between the difference of estimated health ages by using two different computer software versions was completed. The finding indicates that the complex metabolism model of his chronic software version would gain an extra 1.4% of accuracy on estimating his health age when compared to the simplified APP version.

The author is not a fortune teller who uses a crystal ball to predict his or other people's future life expectancy. Rather, he is a scientist who applies solid and sophisticated scientific techniques, such as math-physical medicine with biomedical evidence, to develop a simple arithmetical formula which can serve as a useful tool for the general population to maintain their health and achieve their desired longevity.

Introduction

This is the fourth article the author has written regarding the subject of effective health age ("Health Age") related to the medical branch of geriatrics. Originally, he used his metabolism indexes data which were collected and processed via a sophisticated software for researchers. Later, he developed a simplified APP on the iPhone for other patients. This specific article discusses the differences of health input data and output results based on metabolism indexes and estimated health ages between these two different software versions.

Methods

The author became interested in geriatrics in 2019, especially in regard to longevity. Since 2010, he studied and researched metabolism, endocrinology, and chronic diseases for 10 years. In 2014, he applied topology concept of mathematics and finite element method of engineering to develop a mathematical model for estimating the state of human metabolism. The collected massive data amount of ~2 million on his metabolism state and chronic diseases allowed him to extend his research work into longevity.

In January 2020, he published his first paper on geriatrics, *Effective health age resulting from metabolic condition changes and lifestyle maintenance program (No.223)* and received interests from many readers and article reviewers.

Therefore, in July 2020, he decided to develop a simplified application software or APP on the iPhone for estimating a patient's effective health age ("Health Age") with or without chronic diseases to compare against their biological real age ("Real Age"). He then published his work in his second geriatric paper, *Estimation of Metabolism Index and Effective Health Age using a simple APP tool on iPhone for chronic diseases control and overall health maintenance (No. 292)*. By using data from four key medical conditions based on the health examination reports of four biomarkers including weight, glucose, blood pressure, and lipids, along with six user input lifestyle details including food, water intake, exercise, sleep, stress, and daily life routines. This APP could instantly calculate and show both metabolism index (MI) score, and Health Age on an iPhone.

His third geriatric paper, *Calibrating the estimated health age via metabolism index using GH-Method: math-physical medicine (No. 313)*, aims at calibrating the accuracy of his estimated health age by varying the amplification factor (AF) in his defined arithmetical formula:

*Effective Health Age = Real Biological Age * (1+((MI-0.735)/0.735)/Amplification factor)*

This "AF' is just a simple adjustment factor that makes the estimated health age to reflect the user's real medical and health conditions as accurate as possible. In the third article, he tried 1, 2, and 4 as the AF values and found the AF value of 2 as the most suitable parameters for estimating his own health age.

As we know, metabolism is the fundamental building block for disease control, health maintenance, and longevity. The author spent three years to develop this complex mathematical model of metabolism, and the simple formula above for estimating health age by himself; therefore, he must conduct research on this equation's most vital influential factor, metabolism indexes (m1 through m10). In this fourth geriatric paper No. 323, he focuses on the differences of metabolism indexes (m1 through m10) and their impact on health ages between the sophisticated software for researchers and simplified APP for patients.

A healthy person or APP user should have lower values on the biomarkers and lifestyle details, resulting in a lower MI score. This lower MI score, which indicates healthier, would then make the health age below the real age and vice versa. By maintaining a good lifestyle program with healthy medical examination outcomes, the overall metabolism status will be above the standard; therefore, the immune system will be strong and effective. With a strong immunity, their bodies will be able to defend against various diseases, including complications from chronic diseases (50% of death cases), cancers (29% of death cases), and infectious diseases (11% of death cases). As a result, heathy people will most likely become members of the "longevity club".

In this study, he used his sophisticated software to calculate his average values of m1 through m10 and the combined MI value during the period of 8/1/2020 to 8/30/2020 as the input data for his health age calculation (Figure 1).

It should be noted that due to the constraint from the recent COVID-19 quarantined situation, he could not go to a biomedical laboratory to obtain his needed lipid data, including LDL, HDL, triglycerides, total cholesterol, and others (ACR, TSH, PSA, etc.). Therefore, he used his average lipid data from 2019 as his input data of m4 (lipid) for his health age calculation (Figure 1).

His complex mathematical metabolism model contains 10 categories and ~500 detailed input elements, while his simplified APP only requires 21 detailed input elements, about 4% of the originally developed model's requirements (Figure 2). It is safe to assume that users do not want to be bothered with such a big load of input data, except for scientific researchers. Obviously, by omitting 96% of the input data in regard to "ease-of-use" concern, would hopefully cause a "small" sacrifice on the prediction accuracy. The purpose of this investigation is to decipher how much accuracy sacrifice of estimated health age the simple APP would have.

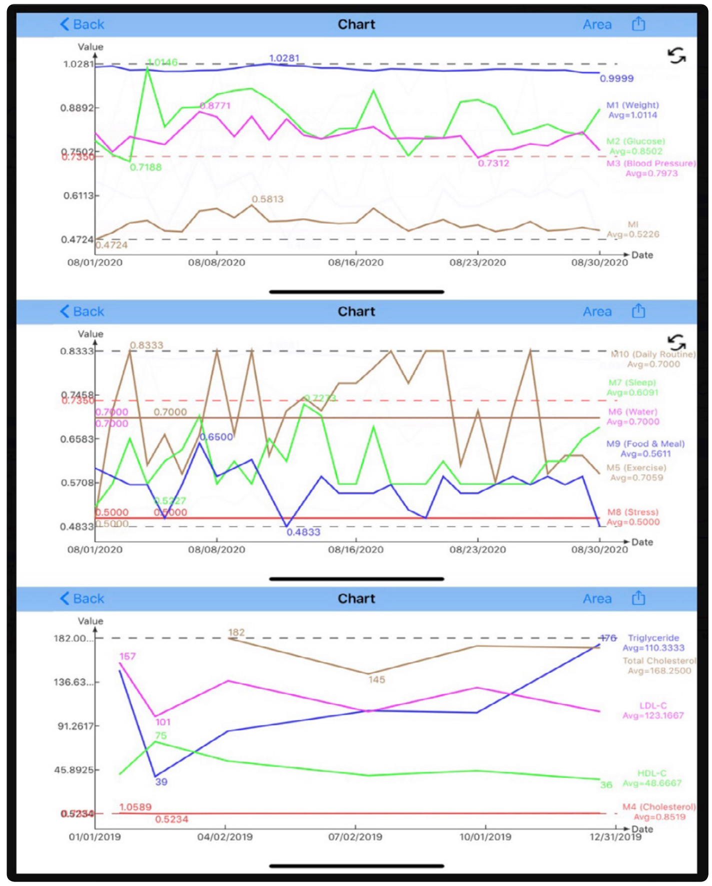

Figure 1: Input data m1 through m10 from 8/1/2020 - 8/30/2020

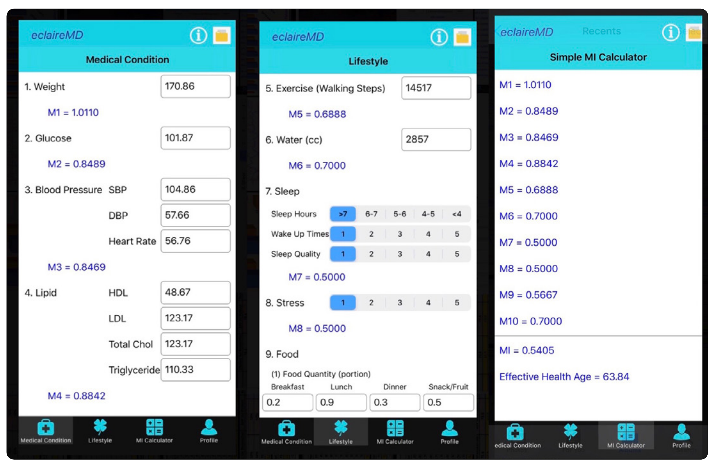

Figure 2: Sample screens of input and output of APP

Results

In Figure 3, it shows the side-by-side comparison of m1 through m10 and the combined MI score between software for researchers and APP for patients. Five categories, m1of weight, m2 of glucose, m6 of water intake, m8 of stress, and m10 of daily life routines, are almost identical to each other in these two versions. Both of m3 of blood pressure, m4 of lipids, and m5 of exercise have minute differences (within 2% to 4% difference) resulting from slightly different selection of parameters for their internal calculations in these two versions. Category m9 (food) supposed to have a bigger difference; however, it only depicts 1% difference. This is due to his carefully selected average meal portions (20% breakfast, 90% lunch, 20% dinner, and 50% snacks/fruits) and having a good habit of keeping high quality, nutritional meals. The category of m7 (sleep) has the biggest deviation of 22% between these two versions. The m7 (sleep) category in his complex metabolism model has 9 elements with 5 selection levels for each element, while the simplified APP only has 3 elements with limited selections.

(8/1/2020-8/31/2020)			
Metabolism Index Items	Chronic for Researcher	APP for Patient	Researcher / Patient
m1 (weight)	101%	101%	100%
m2 (glucose)	85%	85%	100%
m3 (BP)	80%	85%	94%
m4 (lipid)	85%	88%	96%
m5 (exercise)	71%	69%	102%
m6 (water)	70%	70%	100%
m7 (sleep)	61%	50%	122%
m8 (stress)	50%	50%	100%
m9 (food)	56%	57%	99%
m10 (routines)	70%	70%	100%
MI Score	52%	54%	97%
Age	Chronic for Researcher	APP for Patient	Researcher / Patient
Real Age	73.6	73.6	100%
Health Age	62.9	63.8	99%
Health Age - Real Age	-11	-10	109%

Figure 3: Comparison data table of m1 through m10 between two versions

In Figure 4, it illustrates the "real comprehensible values" of input data, not like the "normalized digit format" in categories of m1 through m10. Readers should easily understand the meaning of the data from reading these real numbers, instead of the normalized data in Figure 3. '

8/1/2020 - 8/30/2020	Input data
weight	170.86
glucose	101.87
SBP	104.86
DBP	57.66
HR	56.76
HDL-C (2019 data)	48.67
LDL-C (2019 data)	123.17
total cholestrol (2019 data)	168.25
triglycerides (2019 data)	110.33
walking steps	14517
sleep hours level	1
sleep wake-up times level	1
sleep quality level	1
breakfast portion	0.2
lunch portion	0.9
dinner portion	0.2
snacks/fruits portion	0.5
food quality level	1

Figure 4: Input data of real values

The bar charts are shown as percentages from m1 through m10 along with the MI score between these two versions (Figure 5). The combined MI score from the complex software version is 52% or 0.5226, while the simplified APP version is 54% or 0.5405. Their difference is only ~2%. In other words, the more complicated model would gain an extra 2% of accuracy for the MI score calculation.

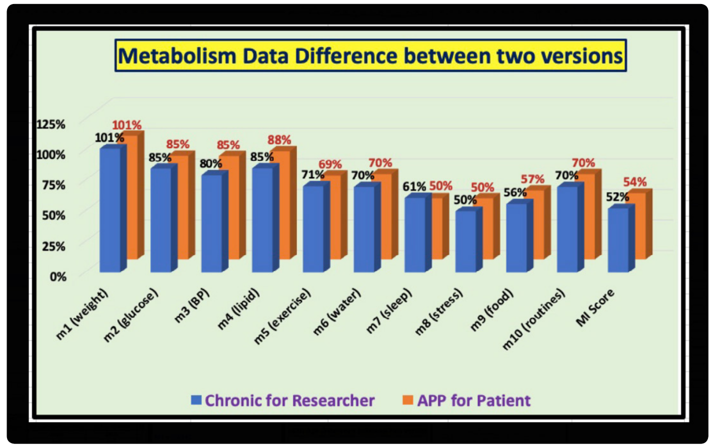

Figure 5: Bart chart comparison of M1 through m10 and MI between two versions

In Figure 6, the bar charts reflect real age, health age, and age difference (health age minus real age) between the two versions. The author's real biological age as of August 2020 is 73.6 years old. However, his estimated health age by the complex software is 62.9 years old and his estimated health age by the simple APP is 63.8 years old; therefore, the estimated health age difference is 0.9 years or with only 1.4% of accuracy difference.

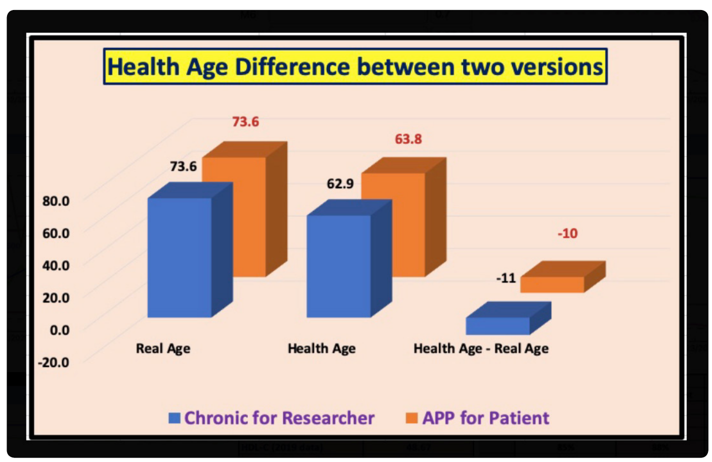

Figure 6: Real age, Health age, and Age difference (Health Age minus Real Age) comparison between two versions

Conclusions

A comparison study between the difference of estimated health ages by using two different computer software versions was completed. The finding indicates that the complex metabolism model of his chronic software version would gain an extra 1.4% of accuracy on estimating his health age when compared to the simplified APP version.

The author is not a fortune teller who uses a crystal ball to predict his or other people's future life expectancy. Rather, he is a scientist who applies solid and sophisticated scientific techniques, such as math-physical medicine with biomedical evidence, to develop a simple arithmetical formula which can serve as a useful tool for the general population to maintain their health and achieve their desired longevity.

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