

## Using GH-Method: Math-Physical Medicine to Investigate the Impact of Different Intensity of Exercise on Postprandial Plasma Glucose (No. 65)

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Submitted: 05 Aug 2020; Accepted: 08 Aug 2020; Published: 12 Aug 2020

### Introduction

The data-set is provided by the author, who uses his own type 2 diabetes (T2D) metabolic conditions control, as a case study via the “math-physical medicine” approach of a non-traditional methodology in medical research.

Math-physical medicine starts with the observation of the human body's physical phenomena (not biological or chemical characteristics), collecting elements of the disease related data (preferring big data), utilizing applicable engineering modeling techniques, developing appropriate mathematical equations (not just statistical analysis), and finally predicting the direction of the development and control mechanism of the disease.

This paper is based on a big data collected from a period of 1,449 days from 5/1/2015 to 4/19/2019, with 4,347 post-meal exercise or walking steps per meal and measured postprandial plasma glucose or PPG (mg/dL). This dataset is provided by a long-term type-2 diabetes patient under a lifestyle management program.

### Method

In the beginning of this analysis period, the author made the following two definitions for his post-meal walking exercise:

1. 1,000 to 2,000 steps as his minimum requirement
2. Above 4,000 steps as his optimal target

He further separated his data into the following five levels of walking intensity:

1. 0 - 1,000 steps
2. 1,000 - 2,000 steps
3. 2,000 - 3,000 steps
4. 3,000 - 4,000 steps
5. 4,000 - 10,000 steps

### Results

1. Inactivity (0-2,000 steps)  
Contribution: 10%  
Average PPG: 133 mg/dL
2. Weak-intensity (2000-3,000 steps)  
Contribution: 16%

Average PPG: 124 mg/dL

3. Low-intensity (3,000-4,000 steps)  
Contribution: 27%

Average PPG: 121 mg/dL

4. Medium-intensity (4,000-10,000 steps)  
Contribution: 76%

Average PPG: 116 mg/dL

5. Overall Average Results  
Average walking: 4,214 steps  
Average PPG: 118 mg/dL

It should be noted that there were three reasons for those 428-inactivity level one

1. 117 airline meals (27%) due to confined environment restricting post-meal walking.
2. Lack of understanding on the importance of “post-meal” exercise at early stage of this period.
3. The patient's plantar fasciitis condition at a later stage to prevent him from having sufficient walking steps.

PPG has a nonlinear inter-relationship with its 19 influential factors. Among them, the combined contribution from both carbs/sugar intake and exercise is ~80%, whereas carbs/sugar ~39% and post-meal walking ~41%.

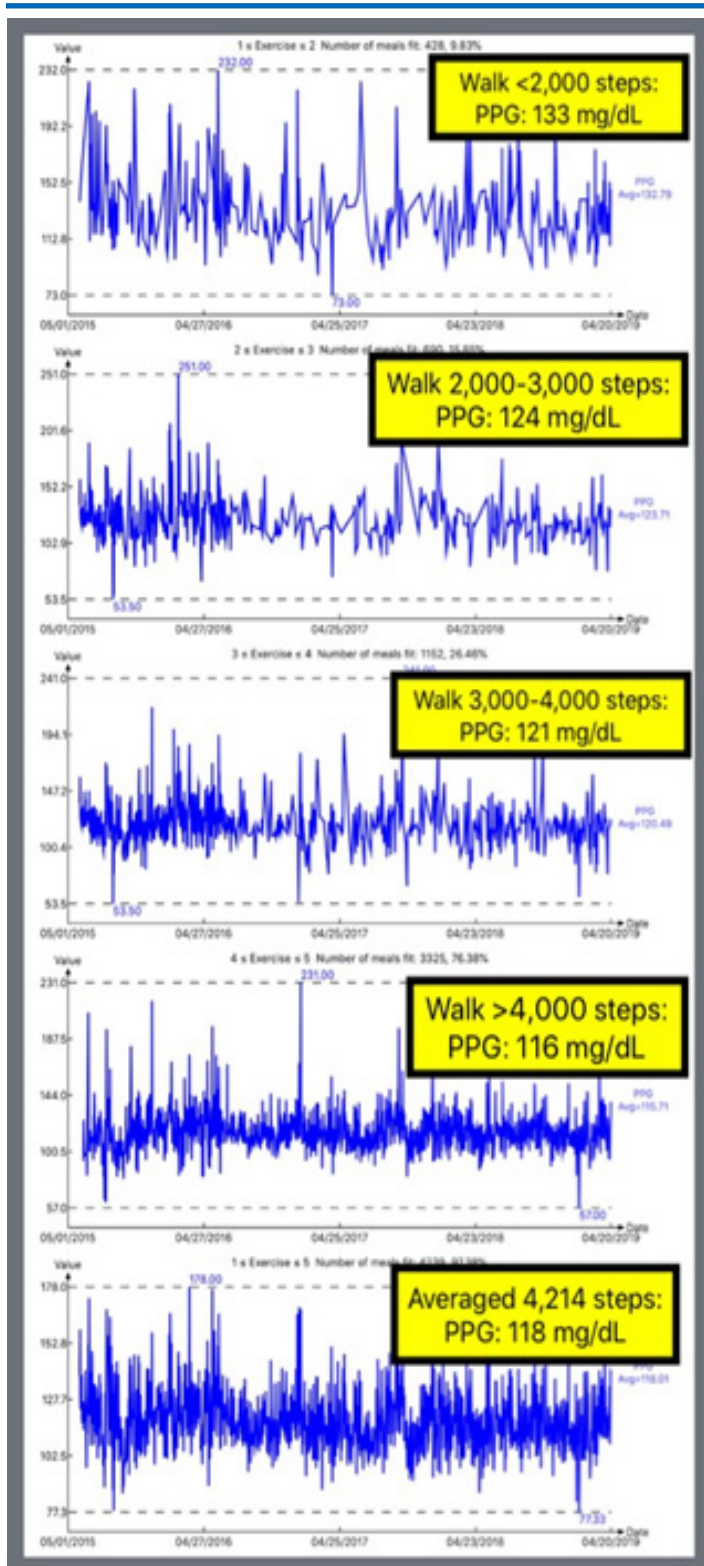
### Conclusion

By using the GH-Method: math-physical medicine, the author investigated the impact from four different intensity levels of post-meal walking on PPG. Through this quantitative analysis, it is obvious that the higher intensity of walking offers better results for the PPG values. These data also showed a “pseudo-linear” mathematical relationship existing between walking steps and PPG values. Based on this analysis, it seems that every block of thousand steps of post-meal walking reduces ~5 mg/dL of PPG value. Therefore, 4,000 steps could reduce ~20 mg/dL of PPG value.

This analysis can also reveal this patient's personality and psychological behavior. He is a strong will person, who persistently follows his exercise regime in order to control his diabetes conditions.

## References

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**Figure 1:** Different intensity of walking levels with their associated PPG values

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