

Science AMA Series: We are David Zeevi and Tal Korem, graduate students at the Weizmann Institute of Science, and authors of a recent study which showed that people respond differently to the same food

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Abstract

Hi Reddit! We're David Zeevi and Tal Korem, graduate students working on personalizing nutritional recommendations by prediction of postprandial glycemic responses. AUA! Obesity and diabetes are practically pandemics; but the dietary recommendations aimed to deal with these conditions are pretty much uniform across all people. Does this make sense? Are people that similar? In our research, we chose to focus on one quantification of the human response to food - the postprandial glycemic response (PPGR) When we digest our food, carbohydrates are broken down to simple sugars, and these are absorbed into the bloodstream, causing an increase in blood glucose levels, which later return to normal, usually with the help of insulin. That same PPGR is linked to obesity, diabetes risk and management (people with the disease try to lower their PPGRs), cardiovascular disease, and many other ailments. But it has an amazing added value - it allows us to immediately measure a response to every food eaten. So instead of prescribing a diet and waiting for months to see how it worked, we can test individual meals and analyze a person's response to them immediately. In our study (video abstract), we profiled 800 people, and found out that they respond very differently to identical meals, which raises the question of effectivity in non-personalized dietary recommendations. We then showed that many personal factors associated with this difference in response: anthropometric measurements (height, weight, etc.); blood test results; and also the composition and function of the microbiome. What we did next was to integrate all of these personal factors and more, as well as what the person actually ate, in terms of fat, protein, etc., into a prediction algorithm that could accurately predict PPGRs to unseen meals. And then finally, we performed a diet intervention study, in which we prescribed subjects with personally tailored diets created with our predictor, and demonstrated that they can reduce PPGRs in a clinical setting. About us - we're both graduate students at the Weizmann Institute of Science, Israel. We're interested in the link between nutrition, microbiome, and glycemic control. Aside from this project, we are also developing methods for microbiome analysis. We'll be back on November 23rd, at 1PM ET (10 am PT, 6 pm UTC) to answer your questions! EDIT: Thanks so much to everyone who participated and asked questions. We had a great time going over your clever insights and doing our best to answer them! We did our best to answer as many as we could. Special thanks to Surf_Science for the initial invitation and for moderating this session. We look forward to bringing you new and exciting research in the future!

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Science AMA Series: We are David Zeevi and Tal Korem, graduate students at the Weizmann Institute of Science, and authors of a recent study which showed that people respond differently to the same food

ZEEVI_AND_KOREM [R/SCIENCE](#)

ABSTRACT

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Obesity and diabetes are practically pandemics; but the dietary recommendations aimed to deal with these conditions are pretty much uniform across all people. Does this make sense? Are people that similar?

In our research, we chose to focus on one quantification of the human response to food - the postprandial glycemic response (PPGR) When we digest our food, carbohydrates are broken down to simple sugars, and these are absorbed into the bloodstream, causing an increase in blood glucose levels, which later return to normal, usually with the help of insulin. That same PPGR is linked to obesity, diabetes risk and management (people with the disease try to lower their PPGRs), cardiovascular disease, and many other ailments. But it has an amazing added value - it allows us to immediately measure a response to every food eaten. So instead of prescribing a diet and waiting for months to see how it worked, we can test individual meals and analyze a person's response to them immediately.

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About us - we're both graduate students at the Weizmann Institute of Science, Israel. We're interested in the link between nutrition, microbiome, and glycemic control. Aside from this project, we are also developing methods for microbiome analysis.

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CORRESPONDENCE:

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would make the most sense? Every 20 minutes after a specific meal for 3 hours?

[primus454](#)

What self testing protocols do you think would allow people to apply this knowledge to themselves instead of guessing half blind with things like elimination diets followed by reintroductions?

I understand why this might be disappointing, but as we haven't tested and validated any self-testing protocols, I will not recommend any here. Our own interventional studies have been performed under the close care of physicians and clinical dietitians, and we recommend to consult a professional before starting any diet. We hope that personal nutrition will soon be available to everyone.

Would blood glucose be the primary test or should other metrics be involved? Also, not everyone would like the idea of attaching to a constant monitor (which I assume is also pricey). What testing intervals would make the most sense? Every 20 minutes after a specific meal for 3 hours?

We chose to look at blood glucose as it is a metabolic parameter that can be viewed at a high resolution (i.e., every few minutes) and is a risk-factor in many metabolic diseases, such as obesity, type II diabetes and heart disease. In a broader sense, I think that measuring other such high-resolution metrics would be very interesting, and I would love to see the results of such a study. Regarding attaching a constant monitor, we thought that for the well-being of our participants and their compliance, it would be ill advised to ask them to draw blood for glucose testing multiple times a day (and btw, most of our participants didn't mind the monitor). In the long run, we don't think that connecting to a constant monitor would even be needed. We get pretty similar accuracy for new participants that weren't connected to a monitor at all. Regarding testing intervals - we found the five minutes resolution of our continuous glucose monitor very good.

-- David

- When you found diverging responses for a particular nutrient, how common were they? Would it be like 400 people responded one way and 400 responded another way? Or 799 people responded one way and 1 person responded differently?
- Do you plan to make your model publicly available? I understand you used gradient boosted regression trees, so releasing the model parameters isn't useful unless you publish them as PMML or something like that. Do you plan to give people access to your model via a webapp or something like that? Or a commercial product of some kind?
- Is there any way normal people can leverage the results of your study to improve their own diet without getting specialized testing for their own glycaemic responses? What is the takeaway for this study for normal people besides "everyone is different?"

[shaggorama](#)

When you found diverging responses for a particular nutrient, how common were they? Would it be like 400 people responded one way and 400 responded another way? Or 799 people responded one way and 1 person responded differently?

In our study, we tested both real-life meals and standardized meals. Standardized meals were foods containing 50g of available carbohydrate that were provided to participants by us. Standardized meals were to be taken in the morning, after the night's fast, without eating anything else or doing physical activity. In this controlled environment, we looked at the responses to three foods: glucose, bread and bread with butter. Out of 702 participants who consumed all three standardized meals, 387 had the highest response to glucose, 236 had the highest response to bread, and 79 had the highest response to bread and butter. It gets a bit more complicated in real-life meals. There are many real-life meals that

were consumed by study participants, as we did not place any limitation on what they should eat apart from the aforementioned standardized meals. Therefore, testing each pair of real-life meals is unfeasible.

Do you plan to make your model publicly available? I understand you used gradient boosted regression trees, so releasing the model parameters isn't useful unless you publish them as PMML or something like that. Do you plan to give people access to your model via a webapp or something like that? Or a commercial product of some kind?

In the paper, we tried to give as much insight into our model as we could, looking at the different features and how they affect people (would love to discuss this further). However, there are a few issues with public/outside use of the model itself:

- The model used in the paper includes close to 140 different features. Some of those are hard to collect for the general public - such as microbiome-derived features or the lifestyle features that we derive from the participants' diaries.
- Even if you were to acquire this kind of data, there are differences between different labs (for blood tests or DNA extraction from stool samples), that we did not have the need to account for, and for outside users would be not taken into account.
- Even if you were to use the exact same procedures - scientifically, you would first need to validate our model (as we did in the paper) on the target population. We have done extensive validation for the Israeli population, and indeed it shares many characteristics with the Western population in general and particularly European population, but this is not enough for public use.

With regards to the webapp idea, one of our current research directions is narrowing down the needs for the full spectrum of personalized data and relying mainly on more focused and easy to get info such as gut microbiome and/or clinical record data. Other research directions, some not performed by us, regard validating our methodological framework on other populations. Eventually, we believe that this will lead to an algorithm that is available to the general public in some manner.

Is there any way normal people can leverage the results of your study to improve their own diet without getting specialized testing for their own glycaemic responses? What is the takeaway for this study for normal people besides "everyone is different?"

For many years, our thinking has been that people develop obesity, diabetes and other diet-related diseases because they are not compliant with our dietary advice. However, based on our study, another possibility is that people are in fact compliant but that the dietary advice that we are giving them is inappropriate. Thus, while the extensive profiling that each of our study participants underwent is not yet available to the general public, we believe that a take-home message for people from our work is that if a diet did not work for you, it may be the diet's fault and not your fault. As mentioned above, we believe our research paves the way to a publicly available personalized nutrition solution. Our vision is to be able to derive predictions and personalized diets using a small set of inputs that people could fill out in questionnaires and a single microbiome sample, and we believe that this is both achievable in the near future and that that would be cost effective and financially viable.

--Tal

Do there appear to be specific profiles or subtypes of responses to different foods, or do diets need to be completely individualized and tailored for each person?

[darbosama](#)

We have performed this kind of analysis for the standardized meals that we provided to participants (all

weighed, provided by us, eaten at standardized conditions, etc.). You can see the result of that analysis at Fig. 2D. The responses of different people to 3 of these pre-provided meals: glucose, bread and bread with butter, certainly cluster together to subtypes. Out of 702 participants who consumed all three standardized meals, 387 had the highest response to glucose, 236 had the highest response to bread, and 79 had the highest response to bread and butter. And even within those groups, there were different subgroups.

You can also see in our analysis in Fig. 2F, that even though there is high variability in the response to different real-life meals, there are foods to which the population's median response is higher than others. For example, the median response to rice is higher than the median response to apples.

Lastly, the prediction algorithm that we've developed does something very similar to what you offer here. However, it has the disadvantage of not being as easily interpretable. We've made some effort in the paper to still dig up some insights about how it worked. For example, we saw that meals with more fat, *in general and on average*, are predicted to elicit lower responses. However, we preach to be careful of these general statements, and indeed when performing more rigorous analysis on the fat content of the meal, we found that its effect is also individualized - for some people it is associated with a marked reduction in glycemic responses - while for others it has very little effect.

--Tal

Hello, and thank you for doing this AMA! I am a graduate student studying the micro biome of honey bees, but I find any micro biome research compelling..So, I have a few questions for you:

Have you/ have you considered studying relationships between micro biome disruption (e.g. dysbiosis as a result of antibiotic use) and the onset of obesity, diabetes, etc?

What is your opinion on fecal transplant therapy as a way to manage PPGR, obesity, and diabetes? Do you think it could be effective, and you think that it would be more effective to manage diet than to directly manipulate the microbiome?

Thanks again!

[Serpes](#)

Hi, Many studies have been conducted on dysbiosis and the onset of metabolic disease (see, for example, the great work of the Jeffrey Gordon lab on obesity, or the papers from [Qin et al.](#) or [Karlsson et al.](#) on Diabetes). Fecal transplant has been shown to ameliorate the severity of impaired glucose tolerance ([http://www.gastrojournal.org/article/S0016-5085\(12\)00892-X/abstract](http://www.gastrojournal.org/article/S0016-5085(12)00892-X/abstract)) in a small cohort of human individuals. It remains to be seen whether this could work for a larger cohort.

We believe that dietary interventions can be very effective, but cannot say if they are more or less effective than FMT. On a more personal note, I would much rather change my diet than receive a stool transplant.

--David

Very cool paper guys.

I note that your algorithm predicts consistent alterations to the gut microbiota. Do you think you could do the reverse of this, i.e. alter someone's gut microbiota (e.g. with a foecal transplant) and predict the alterations to the glycaemic response? If so, do you think your model offers a rational approach to targeted microbiome alterations?

On a different note, I notice that your bosses are hosting/speaking at the upcoming Weizmann next generation immunology/microbiome [conference](#) - will either of you be presenting this data? (I'm waiting to hear back about a scholarship, if I'm lucky I might be there to hear it!)

[jamimmunology](#)

Thanks!

Our algorithm didn't predict alterations to the gut microbiome. It predicts a person's response to meals based on their health status, lifestyle and gut microbiome. We've shown that devising a diet based on these predictions brings upon improvements in blood glucose metrics along with consistent alterations to the gut microbiota. While out of the scope of our research, we do hope to see the science of microbiome research advance to the point in which we could design alterations to the gut microbiome that would bring upon favorable metabolic changes in the host. We think that current scientific efforts will eventually get us there.

Regarding the conference in Weizmann, I think that Eran Segal will be presenting this research, and we will be attending the conference. We would love to see you there, and you are more than invited to grab some lunch with us! (and good luck with the scholarship)

--Tal

Did some people really have ice cream on their "healthy" list??

Also, this study really resonates with me because everyone always says oatmeal is a long lasting, low glycemic food, but it makes me feel awful and starving soon (even without sugar).

[ljuvlig](#)

Indeed, this was not anecdotal. Many people had a low response to ice cream.

-- David

How much does the ethnicity of a person effect their gut flora? Is it always the case that a person born and raised in India will be able to effectively digest spicy food better than Englishman? Or does gastrointestinal tract adapt to the foods that it's exposed to?

Thank you for taking the time to discuss your research. This has always seemed like common sense to me, but this is the first time that I've seen any dedicated study on the subject specific nutrition.

[SweetEmbraceableYou](#)

Hi, can you please see if our [response here](#) satisfies the question?.

Which food had the most drastic difference between people?

[ematics](#)

Many foods had very high variability in postprandial glycemic responses (PPGR) between people. For example, in standardized meals given to people in our study (glucose, bread and bread with butter), participants exhibited the entire range of responses to each of them.

-- David

Thanks for your great work! My parents have diabetes and have been experimenting with their own diets to lower their PPGRs for years.

What were some of the foods you found that had the greatest interpersonal variability, and were there any that affected all participants in the same way?

How long do you think it will take for the average person to be able to benefit from your algorithm?

Have you and the participants in the study changed your/their diets in different ways since you conducted this study?

Again, thanks so much for your rigorous work. This has to be a big step forward from the "x food is good for you" "x food is bad for you" kind of thinking that is propagated nowadays.

[dilatatory tactics](#)

What were some of the foods you found that had the greatest interpersonal variability, and were there any that affected all participants in the same way?

We've found many foods with high interpersonal variability. Many of the responses, even to standardized meals with just 50 grams of carbs, spanned an incredible range of responses. But we didn't really rank them....

In our analyses of complex meals we haven't encountered a specific food that elicited responses with low variability, but we haven't put a specific effort into that.

How long do you think it will take for the average person to be able to benefit from your algorithm?

As I've answered here to a few others - we're working on making this feasible - mainly by reducing the number of different tests needed to profile each participant. We think it's around the corner :)

Have you and the participants in the study changed your/their diets in different ways since you conducted this study?

Our dietitians say that some of the dietary intervention participants are still following up on our recommendations to them (the 'good week' diet) and are seeing good results. But this is an anecdote, not science :) As for myself, while working on the study I've started eating lot's of carbs and drinking lot's of coffee. But I don't think this had a beneficial effect on my health...

--Tal

Did you find any evidence that different combinations of food produced different responses, than if the component parts were eaten alone or part of a different meal?

[koorb](#)

We actually had a result like that in a very controlled setting. We provided our participants with their breakfasts, which they ate under standardized conditions. So most of our participants had two standardized meals of bread, and two standardized meals of bread and butter. The majority of people had a higher response to just bread than to bread with an addition of butter - so this is a great example of a case where combining foods produces a better response than each component separately, and we are certain that there are many others. When later performing a post-hoc analysis of our prediction algorithm, we've seen that on average, the algorithm predicts lower PPGR for meals with higher fat content (for a given carbohydrate content). However, additional analysis we have performed showed that the effect of fat is also person specific, where it has a major effect for some and no effect for

others.

--Tal

*Your study focused on glucose response. But glucose response is not always proportional to insulin response. It's highly disproportionate with high-fat and high-protein foods. Proteins and fats elicit nearly as much or even more insulin than do unrefined carbs.

<http://ajcn.nutrition.org/content/66/5/1264.full.pdf>

From your paper:

with regard to PPGRs, approaches that grade dietary ingredients as universally "good" or "bad" based on their average PPGR in the population may have limited utility for an individual

Do you think you should clarify for the public that glucose response is not always proportional to insulin response? You're promoting the idea that people should fit their diets to their glucose response but glucose response is only half the story.

*Are you going to share the data? I'd like to see the results for specific foods or at least macronutrients.

*I read on a news release of this paper that a banana had two opposite results on two different people. Will you comment on the implications of that? Specifically, does it mean that one person with a negative reaction should avoid that food altogether or perhaps ween themselves onto it until their body has an appropriate reaction?

*Are you familiar with Dr. Neal Barnard's work on diabetes? Is there a contradiction between his findings that diabetes type II is reversed on a low-fat, low-protein whole-food plant-based diet and your findings? Again, specific data would clear the air here.

*It is true that increased glucose response is linked with diabetes type II. However, is the problem with glucose or insulin? A proposed mechanism, by the same doctors who reported clinical reversal of diabetes, suggests that fat blocks insulin from entering the cells to appropriately respond to glucose. Are you familiar with this mechanism and how does this relate to your findings?

*Suggesting that no one diet is for everyone is very bold. This has the potential to be a dangerous rationalization for a bad diet. It would be great if you could be transparent with your data so the public can see for themselves how exactly one should fit a diet to one's self. Without a mention of at least macronutrients, I'm afraid your results are useless to me, as a reader. Does "no one diet fits all" mean that I should eat 90% carbs while my neighbor should eat 90% fat? Or is it a smaller difference, say I should eat 90% carbs and my neighbor should eat 85%? Or are macronutrients less important and it's the type of food that matters?

*Your paper states:

Factors that may affect interpersonal differences in PPGRs include genetics (Carpenter et al., 2015), lifestyle (Dunstan et al., 2012), insulin sensitivity (Himsworth, 1934), and exocrine pancreatic and glucose transporters activity levels (Gibbs et al., 1995).

If I want to be healthy should I focus on optimizing the listed factors or focus on a diet that achieves a particular glucose response? If glucose response is dependent on the listed factors, wouldn't it make sense to focus on those factors- the cause of my glucose response? If I should be focused on those factors, why do you suggest I worry about how a diet fits my glucose response?

*How effective at lowering rates of the diseases you mentioned do you believe tailoring one's diet to glucose response will be?

[Potassium_Legs](#)

Regarding PPGR vs. insulin measurements: High PPGR (postprandial hyperglycemia) was shown to be a risk factor for the development of type II diabetes, cardiovascular disease, obesity, and liver cirrhosis. We have corroborated that in our study, where we demonstrate that PPGR associates with multiple known risk factors, including glycated hemoglobin (HbA1c), wakeup glucose, age and BMI. We also show that these associations are not limited to extreme values (i.e., they are not apparent only in those people with an extremely high PPGR) but rather persist along the entire range of PPGRs, suggesting that a reduction in PPGR is associated with a reduction in risk even in normal individuals. Thus we do not believe that PPGRs are only half the story - we find them strongly associated with the global metabolic disease epidemic. That said, we would have been very happy to measure insulin alongside glucose. But while blood glucose levels are easy to measure continuously outside of a clinical setting, insulin level measurement requires to draw blood. Employing such a test would have confined us to a very limited study (it seems unfeasible to draw blood 2000 times a week for an insulin test, especially in a sleeping individual).

Regarding personalized responses to food: Indeed, we showed that different people respond very differently to food, and that this variability depends on several factors, including their lifestyle, medical status and gut microbiome. And because people can change their lifestyle, their medical state and their gut microbiome, their response to food may change as well. Hopefully, our predictor can account for these factors and recommend to this one person if they should or should not eat the banana in question.

Regarding treatment of diabetes, since we did not take diagnosed diabetics to participate in our study (we had a few undiagnosed, however), we did not specifically test our algorithm on diabetics. I am not aware of a validated dietary treatment for diabetes.

Regarding lowering rates of disease, we have shown, in a double blinded dietary intervention that diets based on our predictor are effective in lowering the glycemic response to foods. However, they were only tested for one week - so no long term effects were seen. One exciting future direction is testing this on a longer timescale that would allow us to follow other clinical parameters such as BMI, HbA1c, and cholesterol levels.

-- David

How do you feel about the ketogenic diet?

[BowQueesha](#)

The ketogenic diet (meaning a diet with very little carbohydrate content) may indeed be advantageous for lowering the blood sugar response to meals, as this response is correlated with the amount of carbohydrates in the food (though not only that, as shown in our work). However, multiple studies have shown that very low carb diets are harder to follow (in terms of compliance), and thus may be less effective in the long run.

Were there any identifiable physical or emotional reactions in subjects with poor food absorption?

[AC_Slaughter](#)

This is a very interesting question, and a very exciting possible link between nutrition, psychology and, possibly, the gut microbiome. Unfortunately, this was beyond the scope of our research so we did not answer that. -- David

What were the most unexpected patterns you observed in your subjects' ppgr responses?

[nick42578](#)

In some of the cases, we've seen a response that has a quick rise of sugar, followed by a quick drop of sugar, followed by an additional rise. At first, we were quite suspicious of these dynamics, and wondered whether the participant ate something else in between the two rises. But after seeing that pattern recur, and also with the standardized meals, we hypothesize (not validated) that this may be the result of massive secretion of insulin (which causes the drop, and then corrected for).

I recently developed IBS. How long into the future do you think we will have a service available that maps your gut bacteria etc. for personalized dietary planning?

[SpookySP](#)

IBS is a widespread disorder which is thought to be affected by many factors, such as nutrition and gut bacteria, but also intrinsic factors such as stress-related ones. We think that this is a very interesting question, which, unfortunately, we did not address in our study. We hope that we, or others, would look into this soon. --David

I find this subject to be quite fascinating, because I've found that I react differently to food than people around me. I always thought it super unfair that when I was a teenager, my little sister consistently finished my portions for me, and yet I was still consistently gaining weight, while she wasn't. Thankfully, I finally figured out what was wrong. I'm living with PCOS, and I can only help to control my symptoms and weight through a ketogenic diet and restricted calories.

My question is about calories in vs calories out. It's always frustrated me when people put down the obese by saying, "It's just a simple matter of burning more calories than you eat!" It's never been that simple for me. Calories are these weird, arbitrary numbers that have to do with heating water, right? So a food's calorie value may have nothing to do with the way that food interacts with different peoples' bodies?

How do you think this discovery will change the way people look at weight loss and calories in vs calories out?

[basilhazel](#)

Calories are indeed a measure of the food and not a quantification of the person's response to that food. I do believe that the amounts of Calories consumed is connected to weight gain, but also that this is definitely not the whole story. I'll give two examples from our current and past research. So first, take the example of artificial sweeteners. These have no Caloric values, but last year we were involved in a [work](#) showing that despite that, they could lead to impaired glucose tolerance.

Second, in this work, in the dietary intervention trial, both the good and the bad menus had the same amounts of Calories - showing a very pronounced difference in PPGRs nevertheless.

--Tal

Is the assumption that certain kinds of PPGR (spiky?) are bad for everyone? Or could people also differ in how their health responds to PPGR?

[ljuvlig](#)

PPGRs are an established risk factor for many metabolic diseases (type II diabetes, obesity, etc.). But you are correct - a risk factor isn't a final sentence (as will tell you the few lucky heavy smokers that never develop lung cancer...).

It could be true that some people are "PPGR resilient". We currently have no way of telling out who, and it would be super interesting to address this question. We might be able to try and answer it when we perform long-term personalized dietary intervention. We could then try to see if we identify sub-populations of people that have a reduction in PPGR with no other effect on their health.

Amazing work! My question is: how do you see your work empowering individuals either now or further down the road? In other words, what can the lay person do now to improve their diet and overall health? What can they see happening in the future? (Now that we know many factors effect response to diet and one's response to diet.)

EDIT: also i think you have a broken link?

[PhosphoErk](#)

In our study we showed the importance of personalized nutrition and how it could have positive implication on a person's glycemic health. We also showed an algorithm that can personally tailor diets per individual. We hope that it would be publicly available in the near future. In this work we performed a short-term dietary intervention trial that showed great promise. We are currently pursuing more challenging long-term dietary interventions, with the hope of successfully improving glycemic control and/or insulin sensitivity, weight, and other metabolic parameters. Additionally, our study presented a unique methodological framework, and after its success in the very hard setting of healthy, not perturbed individuals, we are applying the same design to other, diseased populations. We are currently working on diabetic populations (both type I and II), and hope to show that prediction algorithms specifically tailored to these populations could improve quality of life and reduce comorbidities. -- David

Any thoughts on Soylent or similar foods?

[PM ME YOUR MECHANISM](#)

While we did not test the personalized response to Soylent, it would be easy, as with any other food, to predict a person's response to it given that person's medical and lifestyle data, and their gut microbiome data. -- David

Have you heard of eating according to one's blood type? Since there are so many disease risk correlations with ABO blood type, would it be too far-fetched to include this in a future data set?

[battleforhealth](#)

While we have measured a multitude of many different personal parameters (medical background and food frequency questionnaires, complete blood count, lipid profile, full gut microbiota DNA sequencing, physical activity, food intake) and associated them with blood glucose response to food, we have not measured blood type. We did, however, obtain self-reported blood type information from our participants and adding this feature to our predictor of post-meal blood glucose responses to food did not further improve the predictions.

--Tal

Does this shed any doubt on the "calories in/calories out" weight-loss adage? Are some people going to absorb greater/fewer calories than others from certain foods?

[RealityIsMyReligion](#)

We currently have no way of measuring the actual caloric absorption from food (at least not one that I'm aware of). However, we believe that there is more to nutrition than calories in/calories out, see my [response here](#) for some insights.

How do people respond to pizza?

[Golmin3](#)

In our dietary intervention study, where we constructed 'good' and 'bad' menus for people, pizza appeared on the 'good' menu of some people and on the 'bad' menu of others. --David

If prediction algorithm can predict PPGR for people, does that mean PPGR on a person is not changing over time (not because of age but most importantly because of the diet)? If not, what are the personal factor which effect the prediction algorithm that is possible to change by diet?

[rosencreuz](#)

Actually, many of the input parameters going into our predictor are in fact expected to change. First, there are lifestyle parameters, that change from meal to meal - for example, the time from the last sleep, or the amount of dietary fibers consumed in the previous 24 hours. Other personal features also change - We've shown that the microbiome changes following intervention, and we could also expect that if our algorithm does help someone lower their PPGR, their HbA1c% would also improve.

We believe that some "re-profiling" of these personal features would be needed in long-term intervention exactly for that reason, and are currently in active research of this question.

--Tal

What do you eat on a daily basis? What changed your own personal eating habits as a result of your findings? What's your morning routine? How long do you sleep each night?

[Tinkletyme](#)

Well, I'm really not a great example for a healthy lifestyle. With a work-life balance that's somewhat off, I sleep ~5 hours every night, eat whatever is available, and haven't really changed my diet following the study. (Also, I didn't get to analyze my own data....)

--Tal

Did this invalidate general diet advice?

[moodog72](#)

We don't think it does. It rather adds to the body of knowledge.

While risking over simplification, we could view general dietary recommendations as aiming to improve health *on average*. And there are quite a few validated diets that do that. Again, over simplifying, this paper is not about the average, but rather about variation from it. Our claim is that while general diet advice could be true on average, it still leaves a significant amount of people that deviate from that average enough so that they wouldn't benefit from it.

--Tal

I am wondering if your research could be applied to the food sector and professional chefs from around the world. Like for example an exact identical pasta dish made by Wolfgang Puck and the other one made by Gordon Ramsey to be in a blind taste test judged by other famous chefs. Perhaps adding more than two chefs cooking and seeing if the "taste buds" of the professionals are able to distinguish the differences? Or something along those lines or even something else as it relates to the professional food sector industry? I just figure what might be too sweet or salty for one professional chef might be just right for another one.

[3ThreeD](#)

Sounds like a neat idea :)