



Changing Behavior with Embedded Sensors

Defeating Obesity, Heart Disease, and Diabetes by self-regulating blood sugar



The Story



Three years ago I borrowed a Continuous Glucose Monitor (an embedded sensor worn on the back of the arm to measure blood sugar) and discovered I had late-stage prediabetes.

Through trial and error I learned that the default interface made my blood sugar worse: stress triggered my body to dump sugar into my blood, and seeing my numbers made me stressed.

But when I hacked the UI and stopped looking directly at the data as it was happening, I was able to change how I responded to stress - and cure myself of early onset diabetes.

This proactive leveling of my blood sugar through behavior management not only walked me back from diabetes; it also radically reduced my chance of heart disease, obesity, and COVID-19. ***This experience produced three big insights.***



The First Insight



Physically Embedded Sensors (PES') produce data unlike any other wearable or tracker on the market today. This means a new type of personalized UX is needed.

The data CGMs produce is almost real time. A FitBit or Apple Watch is meaningful in aggregate; the number of steps over a week, hours slept in a day, average heart rate over hours, etc.

With a PES, an overly high blood sugar level means your kidneys are suffering damage NOW.

The data is uniquely personal. There are innumerable reasons a person might eat an ice cream, which means that both the psychological AND the physiological response are unique. Feedback loops need to be similarly unique to be effective.

Because the data is time sensitive and highly psychologically impactful, WHAT, WHEN, and HOW the data is shown becomes critical.

The Second Insight



PES' data is unique, but the number and order of data types is finite and can be tested. This means subsequent product rollouts can have a vastly improved chance of success.

There are a limited number of data types a CGM can produce (amplitude, delta, average, velocity, etc.) You can present those data types in different order and on different time scales, but taken together there is a finite combination of data types that you can present to a user.

This means we can quickly and cheaply multivariate test these at scale to determine which data types produce the most reliable impact on blood sugar levels over time, using existing CGMs and paired cell phones.

The results of this test is a unique data set revealing effective behavior change mechanisms driven by CGM data, and potentially PES' data overall.

The Third Insight



PES interfaces must use personalized feedback loops to produce desired behavior changes. Apple made the iPhone interface the lingua franca of handheld devices. A similar language needs to be developed here.

The same things that make PES' unique - immediacy of data, uniquely personal, using a limited number of data types - means that old ways of displaying data don't create behavior change... and can actually make preconditions worse.

This means that we can create an entirely new commercial language of interaction between our bodies, the data they produce, and our behavior. By mapping out what interfaces produce what kinds of behavior we can maximize positive outcomes.

The first, most successful products launched for non diabetics will define how PES' are used and expanded as platforms... for generations.

The Opportunity



Elevated blood sugar levels predicate many major lifestyle diseases such as obesity, heart disease, and diabetes - the primary indicators for death by Covid-19, in addition to early death by any other cause.

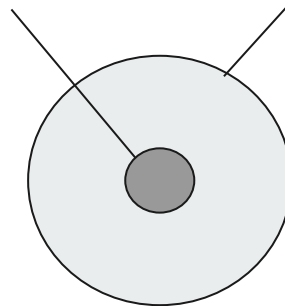
Using a Bayesian adaptive trial, we can test many interfaces on available data types with many different non diabetics users.

This will isolate the most effective interfaces, the best order to use them, and with whom to create actual behavior change.

This new sensor/human “language” would exceed what Apple did with the iPhone and create enormous new market segments for services, hardware, and analytics.

Diabetic CGM users:
Accuracy issues

Non-diabetics: CGM
Accuracy sufficient



Potential Impact



Identifying how to communicate Physically Embedded Sensors data effectively could reduce lifestyle disease mortality rates in more than half of all Americans

...and reduce the rates of non communicable diseases (NCDs) which result in the deaths of 40 million people a year *globally*.

The Game Plan



Use a Bayesian adaptive filter to algorithmically find the best interfaces, demographics, and data to create meaningful behavior change in a broad group of nondiabetics.

1

Map out the data types available across time and measurement scales.

For example, these could be along acceleration, amplitude, and frequency as well as in minute, hour, or days..

2

Design a simple, intuitive interface for each data type.

These interfaces will encapsulate the integrability of the designs, their standalone impact on behavior, and their representation of each data type.

3

Use Medable (an off-the-shelf platform) to trial the interfaces in a large cohort of nondiabetic users.

This platform works with most major CGM systems, is designed for large-scale medical trials, and easily deploys different interfaces as well as collects all data.

The Outcome

This scaled trial will lead to a more tightly-scoped clinical trial with high chances of success in proving that CGMs can be used for behavior change in non diabetics to improve blood sugar levels.

Through this process we will collect anecdotal data, interface interactions, statistical models of usage, health outcomes, cohort models, suggested markets, and potential platform solutions to suggested new product lines.

These insights + the clinical trial data will identify and validate starting points for these new products and platforms, ultimately reducing the risk of heart disease, diabetes, and obesity and improving health outcomes for potentially more than half of the global population.

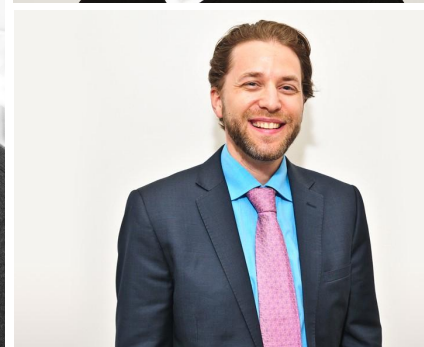


Why us?

Josh Klein. A hacker, technology strategist, and entrepreneur who almost got diabetes because of a CGM - and then recovered by using one. Josh will lead the project. (www.josh.is)

IDEO. Gregory Perez, head of the NY IDEO Office, has worked with medical and diabetes firms the world over. IDEO's human-centric design will produce a deeply considered set of UIs to test. (www.ideo.com)

The Centre for Health and Human Performance. Dr Jack Kreindler founded the Centre to facilitate studies exactly like this one, and has extensive experience working with large clients on a variety of platforms. The CCHP will design and deploy the trial (www.chhp.com).



Note that these partners are suggestions only.

Next Steps

We have the right team. We have the right game plan. We need the right partner who can help us launch the study and take our findings to market.

If you're interested, please contact us at josh@josh.is.





Thank you.

Joshua Klein, H4X Industries, LLC
josh@josh.is +1.347.268.0376

