Inbodied5 and Future Ghosts: sense-making for QS Wellbeing Support

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Abstract
We can collect shed loads of data about our physiological processes. So far applications have presented much of this data in unmediated or naïve ways to their users: a person walks 7 steps, they see 7 steps. This paper presents the inbodied5 as a model for re-presenting quantified self (QS) data for wellbeing; Future Ghosts proposes an application driven by this model for planning QS backed wellbeing practice.

Author Keywords
Wellbeing, quantified self, inbodied5, models

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Introduction
As neuro-physical-electro-chemical-psycho-social creatures, we are incredibly complex systems. These systems are deeply interconnected: our nutrition affects our capacity to move; our movement affects our cognition [9]; our socialization affects our physical wellbeing [7]; our cognition affects our sleep. These are just a small set of the combinatorial interactions that represent us. And yet, despite this complexity of interactions, so far our research and commercial applications in this space have largely focused on representing sensor data in isolation and as rather simplistic counts. A health application with sensor and app may track steps (pedometer/accelerometer data) and movement in sleep (actigraphy); it may connect with a food logger to estimate calories spent (based often on self logging and not deeply accurate [1]databases of food calorie values), but the connections between these systems is missing. There may be a weak and dubious connection such as "you've burned 10 calories doing some steps therefore you can eat ten more calories today." Or there may be no connection: a person wishes to loose weight, has a wifi scale, uses a sleep monitor, has a food logger, all

potentially from the same company device ecosystem. The data may show calories have dropped but weight is static. It also shows that sleep is disrupted. If the person doesn't know that sleep has a key effect on weight loss, they may simply keep dropping calories, which can actually further stall weight loss.

It may be time, therefore, for us in the quantified self space, to look towards models that help us support a person's sensemaking around wellbeing data. To this end, we propose two mechanisms: the inbodied5 model and Future Ghosts. Inbodied5 is a model for wellbeing though which we can associate and correlate wellbeing data analysis. Future Ghosts is a path for leveraging collective data around the inbodied5 for greater global wellbeing.

INBODIED 5: a model for wellbeing

We are complex systems. Indeed, in physiology the body (of which the brain is a part) is factored into 11 systems from skin and nerves to excrement and sex[1] These systems interact with each other. The inbodied5 is a model of 5 essential or fundamental *processes* among these systems that research shows we need to optimize or mortality risk increases significantly. Fundamentally, we need to move, think, eat, socialize and sleep. And we need learn and practice the skills for each to the degree that they have a positive effect.

To eat and sleep may seem obvious members of the 5: if we do not eat for a period of time, we starve and die. If we do not sleep for a period of time, we die. Our bodies also require movement. Sedentarism – the lack of movement – is being proposed as a new coronary risk factor [2]. Likewise, research shows unequivocally that mortality rates are higher for people who do not socialize with each other in the physical world [5][7]. Similarly, engaging with a subject deeply, such as learning a language, practicing explaining complex subjects, seems to have a protective effect against physiological processes like alzheimers [6].

We offer these five processes not necessarily as final, but as those where (1) current research shows undeniable associations with mortality and (2) that all of us do of necessity on a largely daily basis. While this model offers us a set of parameters against which to quantify factors of wellbeing, what is particularly critical in this model is the interactions it supports to optimize wellbeing. If we want to reduce our body fat, most of us look to some aspect of food[2]. With the inbodied5 model, we can also look at performance on other captured values such as sleep and movement.

New Factors to Quantify: Social & Cognitive

With the inbodied5 we have the opportunity to consider how to capture two new factors for wellbeing: degree of social interaction; depth of cognitive engagement. It is beyond the scope of this paper to detail such measures, but there is scope to do so. For Cognitive Depth, we have concepts like Flow [8]being sufficiently challenged by a task to be engaged and not bored and to feel stimulated by it. There is also Deliberate Practice [4] the uncomfortable component of working at those concepts that we experience as difficult until we have made sense of them and can execute them. There is also work around brain games that is a specialist

[1] One list of the 11 systems is here

[2] Usually, sadly, only calories (rather than nutrient profiles or timings, but that's another issue).

deliberate practice used to help keep people cognitively independent that may act as a measure from time to time the way one checks their current mile pace and heart rate when exploring strength improvements. For social measures, there may be a variety of qualities we can begin to sense, from simple counts of number and frequency of engagements with another during a day, to types of sentence utterances such as length of time listening vs speaking.

We already know that relationships and cognitive engagements have life and death effects on our wellbeing. By sensing attributes of these exchanges, we have the opportunity with the inbodied5 model to contribute new understanding both around what kinds of qualities in these interactions best support wellbeing, but also to look at how these practices are co-effected. We already know that a person with poor sleep quality performs less well cognitively. Does a person with poor sleep socialize more or less frequently/deeply? We also know that less frequent movement during the day, thus more sitting, has a negative effect on health that is not offset by say working out for an hour after sitting all day [Dunstan]. Is the same true of social interaction: that a lack of social engagement during the day, and its effects on sleep or eating, can be offset by a wild weekend?

The key take away of the inbodied5 model for quantified self's attention to quantified wellbeing is that it gives us a fundamental way to begin to consider both the data we wish to capture and how we wish to represent it for wellbeing sensemaking.

Future Ghosts: Being health ancestors

A opportunity for gathering data around the inbodied5 is to help us potentially see our holistic health futures before we embark on a path. For instance, if we are interested in burning some fat, and we've struggled with this in the past, a collection of quantified self data from many participants rendered as future ghosts would let us find data aggregate stereotypes of people like ourselves me (perhaps in terms of age, gender, height, weight, activity level) who are several weeks or months out from us in terms of a practice of interest, like a diet. We may use the computational power over the data to map our own inbodied5 data to find those closest to us who have already achieved what we are striving to do, or who are simply further into the process than us. We can look for models of success, where success may be taking X pounds off and keeping them off over a year, and we can look for when and where we may expect set backs. In particular, with the inbodied5 as a model we can see how things like sleep quality or movement or social engagement correlates with progress. Perhaps especially, we can see from the evidence of even the best exemplars that performance is cyclical rather than constant. In other words with just the data from the inbodied5 model, we can develop a more nuanced view of wellbeing that respects better the complexity of us, and the inter-relation of these fundamental 5 processes of life in a body.

Future Work Ghosts

A challenge for something like an inbodied5 Future Ghost is boot strapping: where do we get the data? While we have identified two new types of data for sensing – social and cognitive – companies are already capturing big chunks of the other three: food, movement and sleep. Makers of monitoring tools from

apps like Runkeeper that track walking, running cycling data with the accelerometers and gps capacity in a phone to dedicated performance computers like Garmin's Edge to services like Strava that provides a way to share and compete with others socially are already capturing tremendous amounts of data about us. There are now APIs like HealthGraph by Runkeeper.com[3] that are letting these applications share data between each other. None of these services, however, are releasing this data in any kind of anonymised or aggregate form for research.

In speaking with many of these companies, it's clear most wish to support open data, but several have told us they're small and do not have the resources to contribute development cycles for such pro bono work. It may be that the quantified self community could take as a Social if not Grand Challenge, working with these developers in this growing industry to make it easy to publish data; to work with individuals to make it easy share their data and know that it is safely anonymised. Offering tax incentives to businesses that create open-data exports of their data (against some standard of usability, so not aggregated into obscurity) may be one mechanism to nudge data release, and thus be seen as Good Companies for doing so. Open Data becomes a consumer decision point for engaging with one provider rather than another, for example.

Conclusion

With the inbodied5 we have a fundamental model to help us both contribute to knowledge about and improve understanding of our own wellbeing in a from a quantifiably richer way. We also have two new-ish areas to consider quantification for wellbeing. With Future Ghosts, we have an example of how that richness might be leveraged to help with wellbeing sense-making to help choose paths based on evidence of QS-backed success.

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