Quantified Self, Health APPs and Medical Information
Sociotechnical issues

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The body as data corpus
Science – Clinic – Self-care – Big Data

First glucose meter « Ames Reflectance Meter » (ARM, 1970), and followers.

Santorio Santorio, « Weighing chair », 17th Century
The measurement of the body has been a common medical practice. But the contemporary time is characterized by a sociotechnical shift:

- The computerization of data production and storage devices.
- Consequently, the digitization of the body's biometrics and diagnoses (imaging, genetics, laboratory results, preventative test, etc.).
- The personalization of the data production, by individuals sick or healthy.
- The extension of measurement to self-biometrics, behaviours and lifestyle.
The rise of e-patient
Sociotechnical conditions of possibility

- **1990’s**: Web 1.0. Internet and proliferation of online medical information. BUT the medical web sites were essentially static, offering only few possibilities to exchange singular experiences and data.


- **Since 2010’**: Web 3.0 or Web of data.
The rise of e-health
Sociotechnical conditions of possibility

- Generalization and globalization of standardized communication multi tasks devices (smartphones, tablets, self tracking, etc.).
- Ubiquitous availability of data through multitasking technologies in networks within which each singular user could be specifically profiled.
- Web market and commodification of data.
- Start-Upization of software industry.
The rise of e-health
Sociotechnical conditions of possibility

- Proliferation of lifestyle and health APPs.

- Proliferation of “intelligent captors”

Smart Contact Lens Prototype, Google/Novartis
The rise of e-health
A dense sociotechnical network

« Yet these [health] APPs have proliferated in recent years as part of a constellation of new digital health technologies that include telehealth and telemedicine, digital gaming technologies, digitised medical education and health promotion materials, wearable devices to monitor and measure bodily functions and activities, electronic patient records and booking systems and the use of large digital data sets (“big data”) to generate knowledge about healthcare, health behaviours and disease patterns. »

The rise of Health APPs
What Health APPs are?

- Health APPs are dynamic nodes between:
  - Direct or indirect production data on body functions and behaviours.
  - Algorithms of calculation that (retro)act as norms on user's practices.
  - Users who self-modulate their body and behaviours (movement, diet, biorythm, medical treatments, etc.).
Health APPs are “Bio-Digital Objects” which make visible dimensions of the body and behaviours that were previously hidden, and expose them to the user in order to orient his/her behaviours (and potentially to share them with others). (see Webster, A (2012). Introduction: Bio-objects: Exploring the boundaries of life. In Bio-Objects: Life in the 21st Century; Vermeulen, N., Tamminen, S., Webster, A., Eds.; Ashgate: Farnham, UK; pp. 1–10.

- **Physical Activities**: Miles, steps, calories, repetitions, sets, Metabolic equivalents
- **Diet and Nutrition**: Calories consumed, carbs, fat, protein, specific ingredients, glycemic index, satiety, portions, supplement doses, tastiness, cost, location
- **Psychological, Mental, and Cognitive States and Traits**: Mood, happiness, irritation, emotion, anxiety, esteem, depression, confidence IQ, alertness, focus, selective/sustained/divided attention, reaction, memory, verbal fluency, patience, creativity, reasoning, psychomotor vigilance
- **Environmental Variables**: Location, architecture, weather, noise, pollution, clutter, light, season
- **Situational Variables**: Context, situation, gratification of situation, time of day, day of week
- **Social Variables**: Influence, trust, charisma, karma, current role/status in the group or social network

The rise of Health APPs
What Health APPs produce?

- Health APPs produce not only discrete data but, above all, temporal continuous data and correlations between diverse categories of data.

The rise of Health APPs
How Health APPs are connected to Big Data in biomedicine

The personal healthome

« The Lemanic Center for Personalized Health » (persp. 2030)
http://events.epfl.ch/files/content/sites/events/files/JSP%202014/Intranet/Research_PersonalizedHealth_Trono.pdf
Health APPs are behaviours guidance tools. In their way, they are thus “life modifiers” (“Modificateurs de la vie”, as Claude Bernard qualified drugs).

The question could than be: What is the “active ingredient” of Health APPs?
The “active ingredient” of Health APPs is the Self itself, mediated by technology:

- Health technologies like Health APPs define population groups.
- Conversely, population groups use Health APPs to define themselves.
- In between, one could hypothesize a “looping effect” (notion proposed by the Canadian philosopher Ian Hacking) according to which, people who are being classified by Health APPs tend to accommodate themselves to the norms embedded in algorithms.
- Health APPs have thus a role of “making up people” in inducing new behaviours and, more broadly, a kind of new “technologically assisted selfhood”.

*Conceptualizing Health APPs
APPs and drugs?*
Interactive elements of the looping effect induced by Health APPs.
Health APPs as Bio-Digital Objects act as “biosocial semiotic tools”, i.e. tools producing signs used by users to create meaning, which organizes and shapes human interactions with oneself and with others. This meaning-making process cannot be separated from the social and cultural context.

Source: American Institute for Cancer Research (AICR) « Our 7 Favorite Apps for Good Health (and Cancer Prevention) ». 
Few critical issues
Quality of knowledge embedded in Health APPs

- The scientific validity of integrated data, the collected data and the data produced, that is to say, the whole chain of the data management that lead to the establishment of health standards and norms in respect to which the user is classified by the device.

- Regulation norms, accreditation and supervision (FDA, Swissmedic, etc.).
Few critical issues
Quality of knowledge embedded in Health APPs

- Adapting clinical trials protocols for these new tools

Comparative Effectiveness of Pocket Mobile Echocardiography versus Transthoracic Echocardiography

Description: A new hand held pocket echo device (GE Vscan) has now become available to clinicians, with limited data available comparing the effectiveness of this device as a screening tool when compared to traditional transthoracic echocardiography (TTE).

The investigators are evaluating the effectiveness of this hand-held echo (HHE) device in detecting cardiac pathology in a both inpatient and outpatient clinical setting as compared to a comprehensive TTE evaluation.

Wearable Sensors for Objective Measures of PTSD

Description: A pilot study in collaboration with the Navy to intensively monitor sleep quality, activity and ANS function of 40 servicemen/women dx with PTSD who are already scheduled to take part in a 10 week residential treatment program using an innovative wristband sensor that continuously monitors measures of stress, activity and sleep quality. The hope is to acquire data that in the future will permit markedly improved diagnosis and treatment of PTSD sufferers.
Few critical issues
A shift in public health?

- The traditional “contractual model of prevention” works in the mode of complementarity between 1. the objectivization of health risks done by biomedical research (particularly epidemiology); 2. the movement of subjectivization through which individuals must become actors responsible for their health.


- Health APPs strengthens the role of individuals in these two levels:
  - They induce an unprecedented contribution of individuals to the objectivization of their own specific health risks.
  - They reinforce an the weight and the pace of the subjectification which could lead users to continuous, systematic and maybe frenetic, adaptive behaviours.
“Medicine is an information profession, and the underlying basis of investigation must increasingly include data science. There is a need to invest in strengthening the skills of clinical investigators, very few of whom are thoroughly trained in data science.”


Few critical issues
A shift in health literacy?

Workshop Summary (2009)

Workshop Summary (2015)
Few critical issues
Data, market and politics


Larry Page, Google CEO, TED conference, March 2014.

93% of companies say digital healthcare plays a key role in overall business strategy

53% of companies believe that remote monitoring will be the highest growth area in the next 20 years
Thank you for your attention

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