

*It's quite possible that some people living today don't see any upper limit (of life span). And it's quite possible that some of us in this conversation today see 150, 200 years. And by that time (...) our technology will be so advanced that it will just keep going. [George Church](#). Geneticist. Longevity Mindset: Proof of Age Reversal. October 2020.*

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### **This month's theme: digital twins for resilience and longevity.**

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A [digital twin](#) is defined as a set of virtual information constructs that mimic the structure, context, and behavior of an individual or unique physical asset, which is dynamically updated with data from its physical twin throughout its lifecycle, and ultimately informs for

decisions. It is a virtual representation of a connected physical asset and encompasses the entire product life cycle.

Its [value](#) derives from the ability to move work from a physical to a virtual or digital environment and the ability to predict the state in the future, or when it is not physically desirable, by exploiting the digital model

In health research, for a virtual double to be useful, it is necessary that enough data from the physical person is available. In addition to all markers that change a little or not at all (height, weight, blood type...) it is also important to have social and behavioral indicators (work, diet,...) as well for which [wearable devices](#) are extremely useful. Eventually, minimally invasive sensors, both internal and external, could be envisaged to measure, for example, digestion, breathing, excretions...

[Three-dimensional modeling](#) can be used to visualize the digital companions. Once the system has been verified, computer simulations of

health situations and comparisons are possible.

### **Possible applications for the individuals themselves**

- [Decision support for diagnosis and treatment](#)
- Patient monitoring by wearable devices with "projection" of future consequences, e.g., abnormal heartbeats predictive of cardiac arrest.
- Surgical simulation - surgical risk assessment
- Simulation of the effects of changes in medication intake, exercise, etc.

### **Possible applications in the fields of research**

One of the major reasons why we only have a very imperfect understanding of human biological mechanisms, including those of senescence, is the lack of data available to researchers. Note that it is not the lack of data itself that makes observation difficult, but the lack of shared data.

Comparative analysis of data from digital twins could save many patients. However, this improvement can not be achieved without changing attitudes concerning sharing data.

The first challenge is privacy. In theory, regulations and general principles of law in the European Union and in many other countries allow the use of individuals' health data for public health purposes. In practice, this is rarely the case. It is absurd and contrary to the fundamental right to a healthy life, that access to health data is, in law or in fact, impossible. It is worth noting that almost no one disputes that data for tax purposes should be accessible to tax officials.

### **The "ideal" conditions for making digital twin data useful would be:**

1. Data recording using methods that allow for comparison. Ideally, at least some of the parameters should be measured everywhere by methods that give exactly the same results.
2. Good "data curation". This is the "cleaning" or correction of the incorrect data. It is a complex mechanism, because both "weak signals"

and "abnormal signals" can be due to a measurement error or show an unexpected health phenomenon.

3. Digital twin data is legally a common good. It can only be accessed by accredited persons and only for medical and research purposes. Use for anything else other than scientific purposes could be criminally punishable.

4. For scientific research, a system of security, anonymization or pseudonymization would be instituted whenever technically possible. For example, data could be made available only to scientists with strict guarantees that the results of the research will be published and not patented. It should be noted that in some ways, a system where access to data is almost exclusively via your digital twin is more secure against illegitimate use than a doctor's file. Indeed, any "entry" into the system can be traced without the possibility of "sneaking a look".

5. Obviously, protection against cybercrime is a fundamental issue. Even if it is a little less sensitive than bank protection (fewer people are interested in your diabetes than in your wallet!), your health is more valuable than your wallet.

### **The study of digital twins would allow to:**

1. To choose more adequate treatments according to specific situations, i.e. by taking into account "numerical twins" having similar conditions for many parameters like age, sex, medical past and present, diet, exercise, geographical and social environment, exposure to toxic substances,...

2. Determine more precisely which clinical trials should be prioritized and for which audiences.

3. Determine from weak signals and "surprising" elements (serendipity), research avenues that have not been yet sufficiently explored.

4. Conduct the first tests on computer models (digital twins of existing people), largely replacing both animal and clinical tests.

### **Conclusion**

To date, except in cases of serious health deterioration, few citizens are

constantly monitored for their health. As we are increasingly monitored by numerous electronic devices, a digital twin could become both a [guardian angel](#) for each of us and a contribution to health progress for all.

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### **This month's good news: Singapore aims for 5 more years of healthy life**

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It is one of the states in the world with the highest life expectancy. The NUHS Centre for Healthy Longevity in Singapore, where two brilliant researchers, [Andrea Maier](#) and [Brian Kennedy](#), are working, [aims to increase healthy life expectancy by five years](#), with the first improvements appearing in three to five years.

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### **For more information**

- [Heales](#), [SENS](#), [Longevity Alliance](#), [Longecity](#) & [Lifespan.io](#)
- [Heales Monthly Science News](#)
- [Source of the image](#)