

Digital Twins and the potential for mental healthcare

#ECP2022 - Tom Van Daele & Nele De Witte



Definitions

Data sources

Purpose & need

Limitation and perspectives

Definitions

*what's in a
name?*

Quantified self

Centered on the activity
of self-measurement

Intended for the individual
to benefit from increased
level of self observation

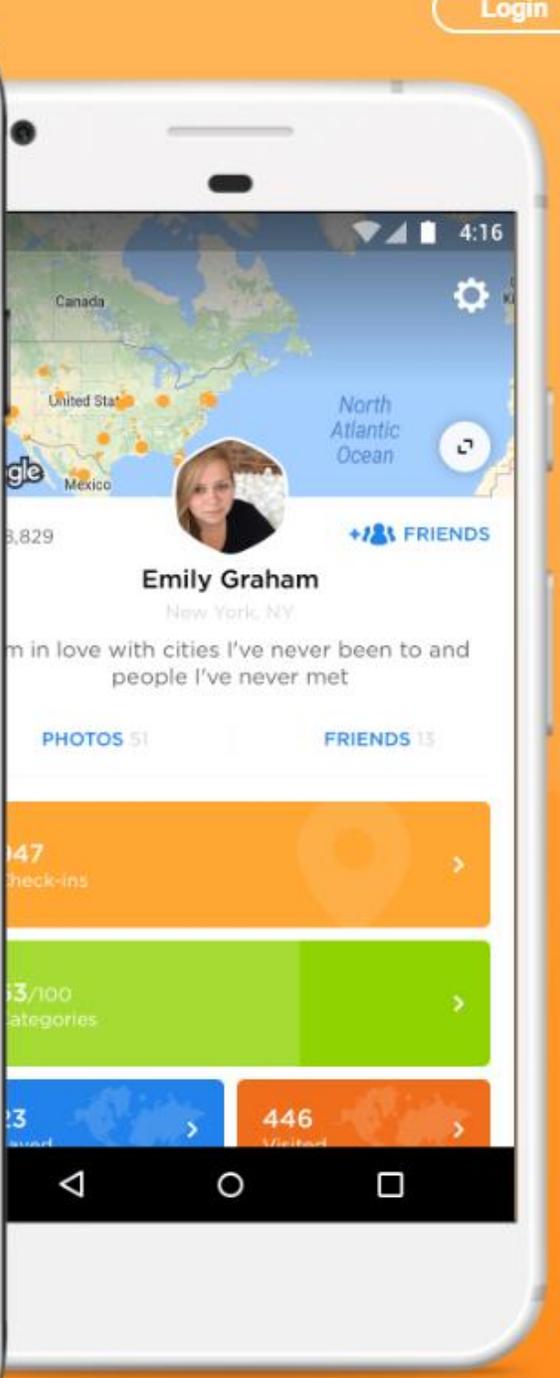
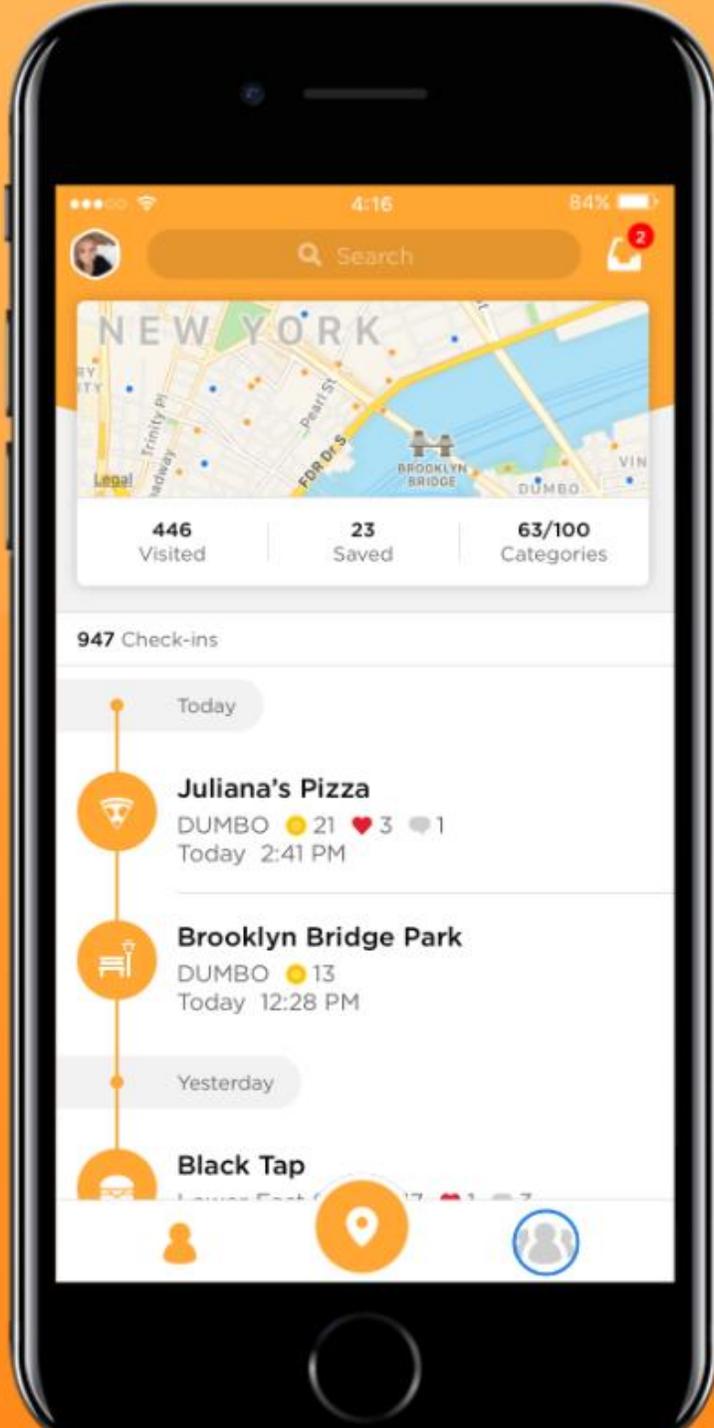
Lupton (2016)



FOURSQUARE Swarm



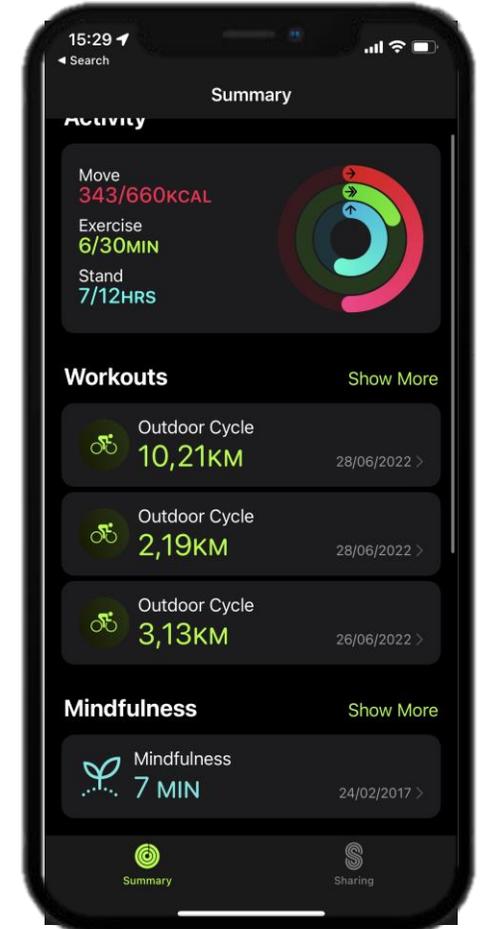
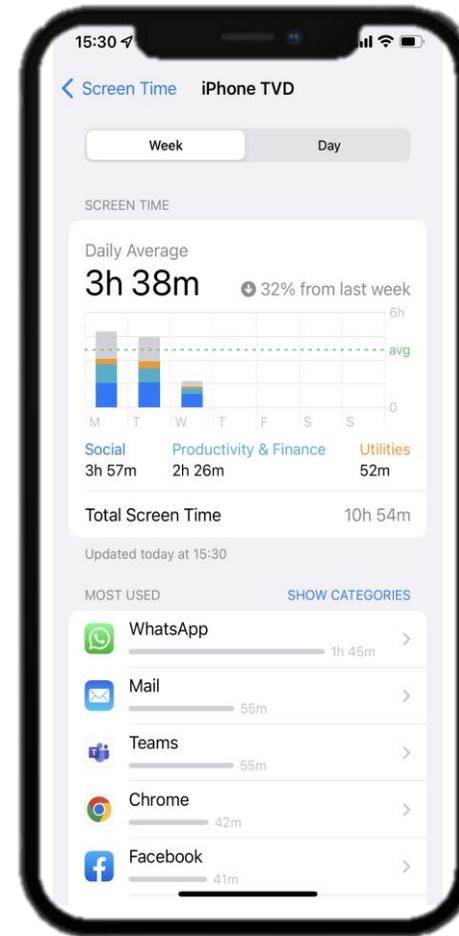
Remember everywhere. 



Digital phenotyping

Moment-by-moment quantification of the individual-level human phenotype in situ using data from personal digital devices.

Same principle as QS, but primarily more medically oriented



Digital twin

From physical replicas at NASA to full scale digital simulations.

Not only digitalising spaceships or their destinations but also their journeys.

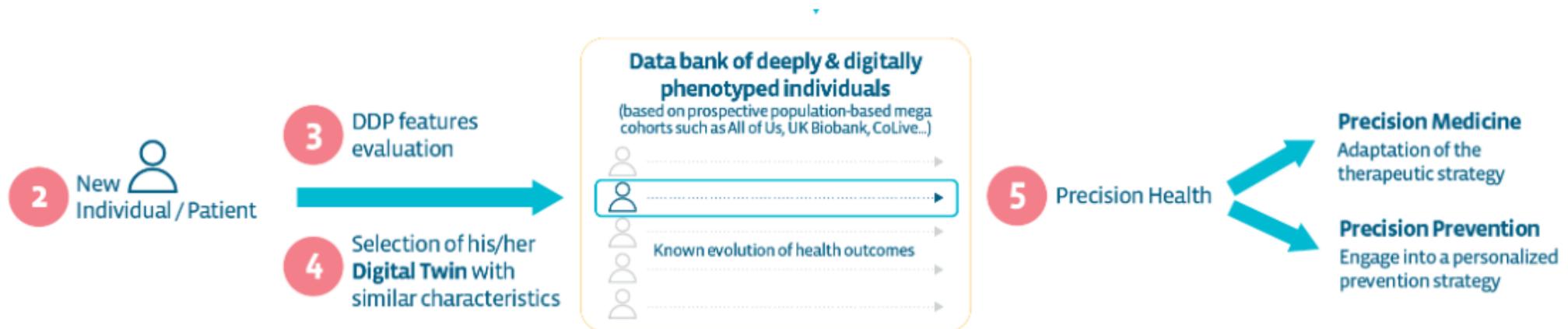
Hundreds or even thousands of different scenarios to witness what might happen.



Tao & Qi. (2020); Apollo 13

Digital twin in healthcare

Links into digital phenotyping
by means of (sets of) algorithms
patterned off current scientific knowledge base



Fagherazzi (2020)

*Data
sources*

*from volume
to vision*

Enormous volumes of data

Clinically generated data

formal healthcare

e.g. electronic patient records

Consumer digital health device-generated data

increasingly sophisticated commercially available connected digital technologies

e.g., Fitbit data

Health-suggestive data

Non-health, non-clinical data

e.g., zip code, local weather, buying habits

Schwartz et al. (2020)

Purpose &
need

*(why) do we
need this?*

Data with a purpose

RTC = inherently limited

Group methods still valuable,
yet insufficient with treatment & testing moving towards
precision of inherent individual differences

Refined & time ordered data

Helps to optimize understanding of evolution,
could offer more timely feedback

Schwartz et al. (2020)

"The average consumer knows more about the operation of their car than their own bodies."



Schwartz et al. (2020)

Limitations &
perspectives

*why should
psychologists
care?*

It's an engineer's world

“There are systematic/quantitative reviews and meta-analyses of digital phenotyping in depression available in literature.

These reviews are primarily published by engineering groups and provide limited psychiatric perspective, especially clinical relevance and clinical integration.”

Kamath et al. (2022)

There's few readily available

< 2% of commercial apps leverage DP potential

No digital twins currently available

entropy/deviation from personal mean

>

absolute sensor measurements

Torous et al. (2021)

Thresholds remain

Validity & quality of data

bias in datasets

Representation of data

importance of context

potential for ethical and effective use in treatment

Kamath et al. (2022)

How might we start moving forward?

Starting point = digital phenotyping,
building on the work done in the field of ESM.

Capturing (more) data & linking to
treatment progression and outcome.

How might we start moving forward?

Aiming for international standards and open data, trying to build digital twins while maintaining anonymity.

Keeping an open eye as psychologists to avoid mere 'technological approaches'.



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Pictures

Slide 5 – Erik Mclean: <https://www.pexels.com/nl-nl/foto/licht-rood-geel-auto-5438616/>