Drawing QSers' mind

A cognitively-informed critical metaphor analysis tracing the cultural model of the Quantified Self

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Thesis submitted to The University of Nottingham for the degree of Doctor of Philosophy

23 September 2019

2 my beloved old chinas

and

dear parents

Acknowledgement

First and foremost, I want to thank distinguished Professor N Katherine Hayles and Professor Kevin Harvey for making an effort to help me finish my PhD at a very difficult time for us all. My sincere gratitude to their encouraging comments and warm, humane support. Thank my co-supervisors Professor Lucy Sargisson and Dr Murray Goulden for their unwavering support when I needed, even when I was far away in China. Thank Professor Peter Stockwell for pointing out to me the cognitively-informed critical discourse analysis, and thank Professor Brigitte Nerlich for convening the great module of Emerging Technologies and Society at the University of Nottingham as well as for sharing with me her insights on metaphor and QS.

I also want to show my appreciation to all the other professors, friends and massagers who have helped me in their own ways. I also want to thank the librarians and Youtube for growing and distributing the useful knowledge for my research. Most of all, I want to thank my beloved parents, whom I can never thank enough with words.

Abstract

With the spread of digital surveillance technologies from the domains of military and medical to those of personal and everyday, we have seen invention of novel metaphors to conceptualise our daily practices as well as our selves in relation to such emerging technologies as Big Data, which aggregate, crunch and sort our personal information collected from the sensors and cameras embedded ubiquitously now in our living environment, known as an 'infosphere.' They sort our selves in a new way, thus altering our self-concept and informing a new, data-driven self culture.

The epitome of this trend is the Quantified Self (QS) movement. The participants, known as QSers and who are prosumers, seek 'self knowledge through numbers' generated by commercial self-monitoring devices, such as Fitbit and Mi Band. They put their bodily activities under self-surveillance for becoming the experts of self-management and self-optimisation. The global popularisation of QS culture has three implications for our human condition. First, it creates a sham utopia. The platform economy brings into being a precariat, who struggle daily for security and success. In response, the QS gadget companies advertise to a white, middle-class clientele that they can offer them both. Second, it promotes neoliberal reflexive practices and discourse of selfhood. QS culture is historically rooted in the American success culture, which prizes individual success made through self-reliance and continuous self-reinvention. This culture foregrounds personal agency in influencing individuals' living conditions and life chances, while discounting social structural factors. Third, it makes privacy, hence self-reinvention, problematic.

When it comes to the issue of ownership of QSers' self-data, it is cognitively ambiguous to whom they belong and whether the QSers can still enjoy 'the right to forget' once the data are uploaded to the cloud.

Sociologists have studied the QS culture and its relations to neoliberalism, but they have not tackled the QSers' subjective experience, particularly their own discourse and mind, in a systematic manner. Meanwhile, although cognitive linguists have had the tools to probe QSers' discourse, mind and culture, or the cognitive schemas and structures that influence QSers' beliefs and behaviours, they have not done so, either. Therefore, my thesis contributes to the QS research by cross-fertilising, or transgressing the boundaries of, the disciplines,

adding to it another dimension of cognitively-informed critical metaphor analysis of QSers' mind.

I have applied critical discourse analysis for both literature review and empirical analysis. For the empirical chapters, I have systematically mapped out the relations between a QSer's use of conceptual metaphors in a blog post and the underlying cognitive schemas, which constitute a cultural model of the Quantified Self for a sample consisting of a small corpus (52,177 words in total). I used the methods of MIP and SMA to identify the linguistic, conceptual and systematic metaphors in a prototypical blog post, sampled from my proprietary corpus of 40 unique QSers' blog texts. Based on the identifications, I further traced three metaphor trajectories, or the blogger's thought patterns, that involved the self, QS tools and data. I found that 1) the blogger thought their HEALTH CONDITIONS WERE OBJECTS that could be managed and controlled with hard work and help from self-monitoring devices, thus giving them a sense of self-made success and being in control. 2) They thought the QS TOOLS WERE PEOPLE, who were productive, capable, intelligent and friendly. This reflects the infosphere's structural influence on people's cognition, which decentres the humans and places them on par with other informational agents or cognisers. 3) They conceived that their DATA WERE VALUABLE RESOURCES, whose ownership was unclear. Meanwhile, alternative metaphors that were relegated to the background by the QS culture were revived and discussed along these trajectories. Altogether, they have demonstrated the framing effects of QS metaphors, i.e. the metaphors can both enable and constrain a QSer's conceptualisation of self in connection with data and self-control.

Contents

Acknowledgement **3**

Abstract **4**

Contents **6**

1. Introduction **10**

1.1 Introducing QS 12

1.1.1 Origin, development and philosophical lineage 14

1.1.1.1 Empiricism, Wired ideology and radicalisation of Humean causality 14

1.1.1.2 Correlation, laws of nature and prediction 16

1.1.2 Propagating QS idea 19

1.1.2.1 Knowledge dissemination venues 19

1.1.2.2 Popularisation strategies 21

1.2 Ethical implications of QS 24

1.2.1 The company we keep and social self 27

1.2.2 QS and role-play 29

2. Literature review **33**

2.1 Metrics, panopticon and self-surveillance 33

2.2 Idealised selves, metrological chains and politics of quantification 36

2.3 Blogs, cultural models and metaphors of big data 43

2.3.1 Blogs as a type of computer-mediated discourse (CMD) 43

2.3.2 Cultural/folk models 49

2.3.2.1 Lexical, textual approach to cultural models 51

2.3.2.2 Scientific and cultural models of self 54

2.3.2.2.1 Subject-self(-other) relations, distributed cognition, posthumanism 61

2.3.3 Metaphors of big data 79

2.4 Cognitive mapping and utopia 83

2.4.1 Types and functions of utopias/dystopias 84

2.4.2 QS as utopia 87

2.4.3 Two QS cases 88

2.4.3.1 Quantified sex 88

2.4.3.2 Weight control apps 89

2.5 Research questions 89

3. Methodology 91

3.1 CMT and cognitively-informed discourse analysis 92

3.1.1 Embodied, enacted metaphors 93

3.1.2 Five steps to identify conceptual metaphor 97

3.2 Applications of method 99

3.2.1 Individual metaphor snapshots 99

3.2.2 Dynamic metaphor activation, transformation 103

3.3 Discussion and summary 108

4. Data collection: Corpus-assisted identification of prototypical QS blogs 110

4.1. Sampling methods 110

4.1.1 Theoretical sampling 110

4.1.2 Prototypical sampling 110

4.2 Corpus construction 110

4.2.1 Target corpus 111

4.2.2 Reference corpus 112

4.3 Identifying prototypical QS blogs using ProtAnt 114

4.3.1 Keywords generation 115

4.3.2 Identifying prototypical QS blogs 117

4.3.3 Keywords in prototypical texts group 119

4.4 Discussion 119

4.5 Summary 121

5. Finding systematicity of metaphors in prototypical QS blog 123

5.1 Introduction 123

5.2 QS metaphor identification and systematic metaphor analysis 123

5.3 Discussion 131

5.4 Summary 136

6. Limitations and future directions 138

Appendix 142

Top 100 keywords (ranked by keyness, descending, continued from left to right) 142

References 144

A 144

B 144

C 146

D 147

E 149

F 149

G 150

H 151

J 151

K 152

L 152

M 154

N 155

O 155

P 155

Q 156

R 156

S 157

T 158

U 159

V 159

W 160

X 160

Z 161

1. Introduction[1]

I bought a used self-balancing scooter in 2016 at a bargain on a Chinese 'second-hand' digital trading platform, similar to ebay, and I rode it around the university campus almost everyday. It moved as fast as a leisurely pedalled bicycle, without me pedalling it. I simply stood steadily and still on this hoverboard, leaning slightly forward to accelerate and backward to break. It sensed my nanoscopic bodily movements and postures precisely in real-time, and responded to them nimbly. It almost felt like the hoverboard had a mind of its own, which was seamlessly connected with mine and obeyed my control so that I could mind-steer it. I was fleet-footed. Perhaps it was as the British science fiction writer Arthur C Clarke put it, 'Any sufficiently advanced technology is indistinguishable from magic.'

Being a long-time practising spectator for my magician friend, I knew that behind any sufficiently smooth magic there are rigorous logic, meticulous calculation and refined techniques. According to my hoverboard's Chinese manufacturer Xiaomi, which bought over its US originator in 2015, this 1,999-yuan-priced 800-watts-dual-motor-powered sleek-designed compact white gadget had a "cutting-edge control algorithm" working together with "multiple sensors of weight, gestures, speed, temperatures, and current" embedded in it, so that it could calculate "every little motion" of my body and adjust the vehicle accordingly "at a speed of 200 times per second," in order to to keep me balanced and steady on the scooter all the time, no matter crossing speed bumps or gritty surfaces (https://ninebot.asia/ninebot-mini/). In other words, my body and I were simply quantified by it tremendously.

Furthermore, beyond me and my machine, my desires and needs were also quantified when I made my purchase on the digital trading platform with a smartphone app, so that the platform could use my behaviour data to guesstimate what I wanted next time and make recommendations or nudge. (In the end, I sold my scooter for a pair of real pedals.) In this human-machine-network configuration, the boundary between the master and the slave was blurred.

I was fascinated by the fact that so many advanced cybernetic techniques were applied to measure and regulate such a small machine in real-time in an effort to eliminate uncontrollable situations on the road and give me an illusion of being fully in charge, which

[1] This doctoral research was carried out at the International Doctoral Innovation Centre (IDIC). The author acknowledge the financial support from Ningbo Education Bureau, Ningbo Science and Technology Bureau, China's MOST, and the University of Nottingham. The work is also partially supported by EPSRC grant no EP/G037574/1.

Photo 1: My hoverboard

would serve as a daily stimulant of ego-boosting self-deception for any struggling, self-efficacy-deficient PhD student. The experience of being on top of it, I'd say, was fairly secure and pleasurable.

Moreover, as a researcher critiquing the Quantified Self (QS) movement from the humanities' perspectives, I also wondered what consequences it would have for the human conditions if this supernova explosion of cutting-edge sensors, quantification and high-speed data crunching techniques, with its extremely empirical and reductionist state of mind, was applied to a human being rather than a machine, with the aims of regulating their own behaviours and gaining (a positive illusion of) control of their own body ?[2] How would that person feel and conceive of it ? This is a pertinent and urgent question to our time, because the more developed regions in the world are increasingly becoming an 'infosphere,' where digital technologies and sensors are becoming ubiquitous, like infrastructures, thus turning not only everything but also every(body) into information (see Floridi 2014: 40-56). In such an infosphere, Floridi said,

> 'We may need to reconsider and redesign our conceptual vocabulary and our ways of giving meaning to, and making sense of, the world (our semanticizing processes and practices) in order to gain a better grasp of our age, and hence a better chance to shape it in the best way and deal successfully with its open problems.' (ibid: Preface)

Consequently, Floridi invented the term 'inforgs,' a critique of the concept of cyborgs, to refer to the humans and other informational organisms embedded in a hyper-informational and hyper-historical environment, where the boundary between online and offline has

[2] Following the usage guides of *they* in both the Oxford Dictionary of English (https://www.lexico.com/en/definition/they) and Merriam-Webster Dictionary (https://www.merriam-webster.com/dictionary/their#usage-1), I use *they, them, themselves* and *their* for the gender-neutral third-person singular, though the Macmillan Dictionary advised against it (https://www.macmillandictionary.com/dictionary/british/they).

disappeared and humans are no longer the centre of infosphere, but rather share the same environment with other informational agents such as smartphones and banks. (ibid: 94-96).
To find out the answers for the human conditions of being inforgs, I studied the Quantified Self (QS) movement, where a group of enthusiasts have used emerging information and communications technologies (ICTs), such as wearable computers and mobile phones, furnished with sensors, to measure their own bodily activities. I analysed a proprietary corpus of 40 unique blogs written between 2013 and 2014 by the QSers about their self-tracking experiences. In particular, I examined systematically which linguistic and conceptual metaphors the bloggers had used to signify their own conceptualisations of *self* and *data* during the activities of self-monitoring.
In the following sections of this chapter, I will introduce the origin, background and development of the QS movement in connection with the social impacts of the digital technology expansion, especially its impacts on our self-cultivation. I will draw from sociology, philosophy, literature and politics. I will also briefly mention the epistemological and ethical consequences of changing forms of identity coming along with the QS (NB: Not to be confused with Quacquarelli Symonds).

1.1 Introducing QS

Since there is no universal definition of the QS, I offer to describe what this growing social, cultural phenomenon is. People have been using various methods, such as writing diaries with pen and paper, to track themselves (including their dreams and psyches) since Greco-Roman time in the West, but the self-tracking using smartphone apps, wearable computers and other emerging digital technologies for life-optimisation and fitness lifestyle purposes is a new phenomenon.
What is particularly novel here is the QS gadgets themselves can automatically generate a large and complex set of data on a daily basis, constituting a QSer's data diary. The raw data are rendered visually by algorithms or computer programmes into pictures, videos, charts and graphs for their users to see, watch and read on a computer screen. Some of the QSers just keep the data diaries to themselves, while many others share them on social networks, such as posting a status update on Facebook or WeChat Moments, thus constructing and maintaining their digital presence in the infosphere. Still, some more active QSers put down in words their thoughts and feelings and experiences after reading their own data diaries and upload them to

the blogosphere, presenting themselves digitally but also serving as knowledge brokers in the QS community.

The practice of writing diaries with numbers, however, has been foreseen by the American anthropologist Clifford Geertz, who wrote in 1980,

‘This genre blurring is more than just a matter of Harry Houdini or Richard Nixon turning up as characters in novels or of midwestern murder sprees described as though a gothic romancer had imagined them. It is philosophical inquiries looking like literary criticism (think of Stanley Cavell on Beckett or Thoreau, Sartre on Flaubert), scientific discussions looking like belles lettres *morceaux* (Lewis Thomas, Loren Eiseley), baroque fantasies presented as deadpan empirical observations (Borges, Barthelme), histories that consist of equations and tables or law court testimony (Fogel and Engerman, Le Roi Ladurie), documentaries that read like true confessions (Mailer), parables posing as ethnographies (Castenada), theoretical treatises set out as travelogues (LÈvi-Strauss), ideological arguments cast as historiographical inquiries (Edward Said), epistemological studies constructed like political tracts (Paul Feyerabend), methodological polemics got up as personal memoirs (James Watson). Nabokov *Pale Fire*, that impossible object made of poetry and fiction, footnotes and images from the clinic, seems very much of the time; one waits only for quantum theory in verse or biography in algebra.’ (Geertz 1980: 165)

Geertz further commented, ’[T]he present jumbling of varieties of discourse has grown to the point where it is becoming difficult either to label authors (What *is* Foucault — historian, philosopher, political theorist ? What Thomas Kuhn — historian, philosopher, sociologist of knowledge ?) or to classify works (What is George Steiner *After Babel*--linguistics, criticism, culture history ? What William Gass *On Being Blue* — treatise, causerie, apologetic ?). And thus it is more than a matter of odd sports and occasional curiosities, or of the admitted fact that the innovative is, by definition, hard to categorize. It is a phenomenon general enough and distinctive enough to suggest that what we are seeing is not just another redrawing of the cultural map — the moving of a few disputed borders, the marking of some more picturesque mountain lakes — but an alteration of the principles of mapping.’ (ibid: 166)

More than three decades later now, for the QSers this new principle of cognitive mapping of the domain or space of the self is known by their slogan as ‘Self knowledge through numbers.’

1.1.1 Origin, development and philosophical lineage

The first QS meet-up, a gathering specifically for this type of self-trackers, was launched in the Bay Area in San Francisco, United States in October 2007 (see Kelly 2007). During a typical meet-up, several QSers would give short presentations, called show-and-tells, to share their self-tracking experiences with an audience. The video recordings of the show-and-tells would later be uploaded online for wider sharing (see Wolf online). Most of these talks were around the themes of health, fitness and life-hacking (such as how to be more efficient and productive, how to control risks, etc.). As of this writing, there were 221 QS gatherings around the world (mostly in the more developed regions) with 96,077 members (https://www.meetup.com/topics/quantified-self/). (Disclosure: I joined it in 2014 for my research.)

The development of the QS is closely connected with the development of new computer technologies and the propagation of their knowledge. The co-founders of the Quantified Self are Wired Magazine editors Kevin Kelly and Gary Wolf. Initially, they were 'looking at some new practices that seemed, loosely, to belong together: life logging, personal genomics, location tracking, biometrics. These new tools… all… had something in common: they added a computational dimension to ordinary existence,' Wolf (2011) said. 'We saw a parallel to the way computers, originally developed to serve military and corporate requirements, became a tool of communication. Could something similar happen with personal data? We hoped so.' (ibid) Therefore, the QS movement was launched riding on a new wave of expansion of the computer technologies, which have been expected to extend to a more personal level of use in everyday life.

1.1.1.1 Empiricism, Wired ideology and radicalisation of Humean causality

According to Wikipedia (2015), Wired is "a monthly American magazine… that reports on how emerging technologies affect culture, the economy and politics." It is also known recently as an active proponent of the concept of big data. For instance, its former editor-in-chief Chris Anderson (2008), who is now the head of TED, the non-profit organisation of the popular TED talks, wrote in a controversial editorial in 2008 titled The End of Theory: The Data Deluge Makes the Scientific Method Obsolete, arguing for the superiority of big data over traditional scientific theories and models for discovery of natural and social laws.

He cited the example of Google, one of the more successful digital companies in our time, writing, 'Peter Norvig, Google's research director, offered an update to George Box's maxim:

“All models are wrong, and increasingly you can succeed without them.” This is a world where massive amounts of data and applied mathematics replace every other tool that might be brought to bear. Out with every theory of human behavior, from linguistics to sociology. Forget taxonomy, ontology, and psychology. Who knows why people do what they do? The point is they do it, and we can track and measure it with unprecedented fidelity. With enough data, the numbers speak for themselves.’

‘Petabytes allow us to say: “Correlation is enough.” We can stop looking for models. We can analyze the data without hypotheses about what it might show. We can throw the numbers into the biggest computing clusters the world has ever seen and let statistical algorithms find patterns where science cannot,’ he added.

This rhetoric for identifying patterns without an understanding of underlying mechanisms (or the denial of necessity between cause and effect) is reminiscent of a radical interpretation of the British empiricist philosopher David Hume’s concept of causality — ‘Causation means nothing but constant conjunction of objects in experience.’ (Psillos: 57) Philosophically, it is known as the Regularity View of Causation (RVC), which states,

> ‘*c* causes *e* iff
>
> (a) *c* is spatiotemporally contiguous to *e*;
>
> (b) e succeeds *c* in time; and
>
> (c) all events of type *C* (i.e., events that are like *c*) are regularly followed by (or are constantly conjoined with) events of type *E* (i.e. events like *e*).’ (ibid: 19)

Hume’s account has been taken to be a reductive one, because ‘on RVC, causation reduces to spatiotemporal contiguity, succession and constant conjunction (regularity). It reduces, that is, to non-causal facts. A corollary of RVC is that there is no necessity in causation: there is no necessary connection between the cause *c* and the effect *e* that goes beyond – or underpins – their regular association.’ RVC has been taken to be the official Humean view and has been embraced by many eminent philosophers ever since, including Mill, Russell, Ayer, Quine, Carnap, Kripke, a few of whom are also philosophers of language interestingly. (ibid: 19-20)

For coming up with his inductive fallibilism, Hume was inspired by Isaac Newton’s methodology of natural science (applied most notably perhaps in Newtons’ discovery of the law of gravity and laws of motion), and aspired to be ‘the Newton of a new science of human nature.’ (De Pierris: 148) ‘In his conception of both the scientific method and the origin and

meaning of our idea of causation, Hume is deeply indebted to what he takes to be the Newtonian inductive methodology for the study of nature.' (ibid: 149)

Intentionally critiquing the deductive rationalists of his time, exemplified by René Descartes and Gottfried Wilhelm Leibniz, Hume rejects *a priori* knowledge in his radically skeptical empiricism, as contrasted with John Locke's more rational conception of scientific methodology. 'Hume's notion of inductive proof, which is at the heart of his conception of causation and scientific methodology, consists in a universalization (whenever possible and subject to future experimental revisions) of our past and present uniform experience, with the attendant assumption that nature is, in Newton's words, "ever consonant with itself" (*Principia*, 795).' (ibid: 149)

Thus the Humean 'inductive derivation of laws from manifest uniform phenomena takes priority over the hypothetical postulation, prior to what experience can teach us, of a hidden microstructure of primary qualities — which, according to the mechanical philosophy (shared by both Descartes and Locke), necessitates the causal relations among bodies and between bodies and our senses.' (ibid:150)

1.1.1.2 Correlation, laws of nature and prediction

The Humean conception of causality not only has everything to do with our contemporary methods for discovering scientific laws but also with making predictions. According to Psillos (2009: 215-218), modern logical empiricists or positivists like Rudolf Carnap and Moritz Schlik inherited and twisted or refined the Humean legacy when applying it to modern science.

'Within science, Carnap stressed, "causality means nothing but a functional dependency of a certain sort" (1928: 264). The functional dependency is between two states of a system, and it can be called a "causal law" if the two states are in temporal proximity, and one precedes the other in time. Schlick expressed this idea succinctly by pointing out that:

> the difference between a mere temporal sequence and a causal sequence is the regularity, the uniformity of the latter. If C is *regularly* followed by E, then C is the cause of E; if E only 'happens' to follow C now and then, the sequence is called mere chance. (1932: 239) [original emphasis]

Any further attempt to show that there was a necessary "tie" between two causally connected events, or a "kind of glue" that holds them together, was taken to have been proved futile by

Hume, who maintained that "it was impossible to discover any 'impression' of the causal nexus" (Schlick 1932: 246).' (Psillos: 215-218)

The positivists even take the concept of causation as a test case for distinction between science and metaphysics. They argue that for metaphysicists, to examine causal relations is a matter of investigating the essence of causation, which goes beyond the phenomenal regularity. '[I]t relies on the "erroneous assumption" that there is something in causation beyond correlation ("i.e. beyond mathematical function"),' as Carnap (1928: 35– 6) explicated (cited by Psillos: 216). The rejection of 'essence' arguably also helps set the modern scientists apart from the folks[3], who hold a common sense view of essentialism in everyday life (e.g. the essence of the self).[4] In contrast, the scientists within the empirical lineage investigate what events are correlated. Carnap claimed that 'the problem of correlation is none other than finding "the laws of nature". But for him, these "laws of nature" are not causal… To be sure, Carnap did not want to excise talk of "cause" and "effect" from science, although he certainly toyed with this idea. But he insisted that the only meaningful content this talk can have is when we call "cause" the event, or the physical magnitude, or the physical state, which temporally precedes another one *nomologically* dependent on the former.' (ibid, emphasis mine)

This can be related to the phenomenon that much applied scientific research nowadays has been dedicated to accumulating know-how instead of 'know-why.' For example, many computer scientists researching big data and artificial intelligence (AI) in the topical area of machine learning (such as deep learning and reinforcement learning) for such applications as computational visual pattern recognition and natural language processing take an agnostic

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[3] The folks are not a fixed demographic, but dynamic. An expert stepping outside the area of their expertise may become a folk person, and a folk person, who is not professionalised in a certain discipline, can still have specialised knowledge in that domain. The folk model of knowledge simply refers to the everyday, common sense and conventional habits of knowing and perceiving the world, and it is neither superior nor inferior to the scientific or expert model. According to Keesing (1987: 380), 'a cognitive theory of folk models, as culturally construed common sense, would perhaps in the long run…take these models as…representing a set of operating strategies for using cultural knowledge in the world; they comprise sets of shortcuts, idealizations, and simplifying paradigms that work just well enough yet need not fit together without contradiction into global systems of coherent knowledge.' A respect for the common sense tradition is also a form of conservatism, as favoured and embodied by, notably, Edmund Burke. More to be discussed in Section 1.1.2 where I deal with the popularisation of scientific knowledge.

[4] C.f. D'Andrade (1995, The theory of essences: 176-178) 'It is a common belief, found in many western cultures, that certain things are the way they are because of some *essence*. [original emphasis] Thus, tigers are said to have a certain essence which makes them tigers, which is not the same thing as the various properties tigers have, like stripes, tails, whiskers, claws, etc… Slightly differing doctrines of essence have been propounded by Aristotle, Aquinas, and various Scholastics: the general doctrine has been attacked by Locke and other empiricists, as Bertrand Russell outlines in his *History of Western Philosophy*.'

approach towards the processes behind the machine learning. They do not aim to proffer any theory to explicate how their algorithms actually 'learn' to 'see' or 'read,' but rather devote themselves to finding out which data sets can better 'train' their algorithms and which mathematical functions and parameterisation methods can help them get better learning results, mainly in terms of higher predictive accuracies, the closer to what they or their sponsors desire the better. There is nothing beyond, behind or below such utilisation of mathematics and statistics. (Some ethical implications of this will be discussed in Section 1.2.) The same can be argued about applied linguistics and, in particular, the rise of corpus and computational linguistics, where searching for regularly and repeatedly appearing patterns such as collocations, lexical bundles and n-grams in large corpora (or big databases) is made more feasible and easier, and arguably it has taken precedence over researching the historical and etymological explanations about how those patterns arise, evolve and come about.

> '"In essence, the imaginary of Big Data resolves the essential problem of modernity and modernist epistemologies, the problem of unintended consequences or side-effects caused by unknown causation, through work on the datafication of the self in its relational embeddedness" (Chandler 2015: 11). What this argument implies is that recording data flows from the self and the world makes it possible to collect personal information and social practices on an unprecedented scale at the micro level of analysis. At that point, big data analytics can interpret their ontological complexity, i.e. not "by generic laws and rules but by feedback loops and changes through iterative and complex relational processes" (Chandler 2015: 18). In medicine, for example, "machine-learning algorithms can improve the accuracy of prediction over the use of conventional regression models by capturing complex, nonlinear relationships in the data" (Chen and Asch 2017: 2507).' (Paganoni 2019: 7-8)

Prediction is paramount, as it is the image of scientists as soothsayers, be they economists or ecologists, that legitimises their entire empirical enterprise in the society. According to Psillos (ibid: 217), for the empiricists the 'operationalization of the concept of causation they were after was not merely an attempt to legitimize the concept of causation,' which is intimately linked with the concept of natural law. 'Rather, it was part and parcel of their view that science aims at *prediction*. If prediction is what *really* matters, then the fact that there can be

regularities, which are not causal in the ordinary sense of the word, appears to be irrelevant. A regularity can be used to predict a future occurrence of an event irrespective of whether it is deemed to be causal or not. The farmer can predict that dawn has broken on hearing the cock's crow irrespective of whether or not the crow causes the sunrise. In physics, one can *predict* the length of the pendulum's rod, given its period, irrespective of the causal connection between these two magnitudes. Correlations can serve prediction, even though they leave untouched some intuitive aspect of causation, according to which not all regularities are causal.' [original emphases]

So the empirical prediction only makes use of the past and present observations and memory and is supported by a operationalised Humean account of causation in terms of correlation, without prescribing any necessary or reliable connection between cause and effect, i.e. inductive fallibilism. This model of prediction has become the sole criterion for measuring success for the scientists with an empirical leaning. And this model of prediction has spread from the scientific community to everyday life through popularisation.

1.1.2 Propagating QS idea

What is particularly interesting to me is how the idea of the QS propagates, i.e. how the idea of self-tracking, or life-logging, for fitness and improving one's life and wellbeing has started small with a niche of practitioners, and has grown into a global phenomenon in many developed parts of the world over the years, entering into the public discourse and provoking actions.

1.1.2.1 Knowledge dissemination venues

I first map out the venues and space of QS knowledge dissemination. Kelly (2012) recounted the history of QS, saying that he came up with the idea of launching a website gathering all the tools for people to measure themselves after chatting with a local paediatrician who had gone on an all-organic diet. Kelly was immediately thinking what tools the doctor could use to measure the changes on himself brought about by the change in diet. Developing from such a thought, Kelly and Wolf started, alongside the physical meet-ups they organised in the Bay Area, their blog quantifiedself.com in 2007, which later turned into a website run by their California-based social enterprise QS Labs, LLC.[5] So the QS movement's major campaigner organises two types of venues, online and offline, to spread the words for QS.

[5] I interviewed the QS Labs' then programme director Ernesto Ramirez in Santa Monica in early 2015 and also met with Gary Wolf in San Francisco the same year.

Their online venue, quantifiedself.com, serves as a hub of information, helping the QSers exchange their largely do-it-yourself (DIY) ideas and experiences, while promoting the adoption of such new ideas, new practices and new technologies to a wider audience on their website. Anyone who has registered on their website can participate in their QS forum discussions. People are also encouraged to organise their own local QS meetups, following some simple guidelines published on the website, as a form of active participation in the QS movement. The influence of the movement strengthens as the number of QS meetups and localities rises. The QSers who organise meetups themselves can get permission to upload the edited videos of their meetup presentations, in a format similar to TED talks organised by Kelly and Wolf's former colleague at Wired, to the website for sharing. For instance, Adriana Lukas was an active organiser and founder of the London QS meetup group. I went to two of its monthly events in 2013 and 2014, respectively. QS Labs also send out regular, free email newsletters, called What We're Reading, to subscribers on updates of QS events, suggested readings as well as recommended show-and-tell articles and blogs — my construction of the QS corpus has used the leads from the newsletters in 2014. They also host two annual conferences in San Francisco, US and Amsterdam, the Netherlands (for European QSers mainly), respectively, gathering QSers but also QS-interested researchers as well as companies from around the world. (I went to one of their annual conferences in Amsterdam in 2017.) Therefore, the concept of QS has entered not only the enthusiasts' discourse but also those of the academics and corporates.

Beside the QS Labs as the major propagating space, many QSers also publish their self-tracking experiences and ideas on their own blogs and websites for sharing with like-minded enthusiasts. They serve as knowledge brokers in the QS community. Companies such as Nike and Fitbit have jumped on the bandwagon lately to advertise their branded QS products in an effort to monetise such novel, initially DIY sort of practices. In the meantime, "[b]oth news coverage of the quantified self and interest on the part of Google Search users… have steadily grown since 2009." (Lupton, 2013a, p26) A Forbes Magazine article called 2013 the Year of the Quantified Self. (Clay, 2013)

Thus, the propagation of the QS idea has been helped to a large extent by the news media, both old and new. In fact, a similar pattern of knowledge dissemination has been identified recently by Paganoni (2019) about the popularisation of the concept of big data, which may

count the QS as a subordinate category of big data in everyday life. As Paganoni put it, '[W]ithin the domain of knowledge dissemination, the news media exercise strong influence as knowledge brokers in the field of science and technology. Journalists, bloggers, academics, freelance writers and critics work to bridge the knowledge gap between technological progress and the general audience, recontextualising and reconceptualising expert opinion from different societal sectors (Bondi et al. 2015; Watson 2016) by means of strategies of popularisation.'

1.1.2.2 Popularisation strategies

However, the popularisation of scientific knowledge is not linear or one-way from the expert to lay audience. According to Corbett (2006: 756), more recent models see the process of popularization 'as part of a nonlinear, dynamic process of translation and negotiation, whereby scientists align themselves with other social groups to contest and redefine the public meanings of scientific discoveries. This view is consistent with specialists' own contribution to popularization and dissolves diffusion's dichotomy between specialist and nonspecialist groups. As van Dijck (1998: 10) observed:

> Despite their powerful position on the discursive hierarchy, scientists have never had absolute authority over the interpretation of knowledge, and thus had to look for effective strategies to propel and defend a specific interested position [. . .]

Popularizations are therefore a forum in which specialists can attempt to form alliances and engage in negotiating the public meaning of specialist knowledge.'

Discourse analyst Myers (2003: 274) also pointed out that the boundary between the scientific and non-scientific knowledge is an artificial construct, which are effortfully maintained — 'for most of the issues in which popularization matters, such a carefully bounded, single-minded, and authoritative science is not possible. We cannot understand why there are tensions about genetically modified organisms, vaccinations, or climate change if we assume that science is distinct from the rest of culture, and that the public is, on scientific matters, a blank slate.' 'Maintaining such boundaries takes work. That is the claim made by Thomas Gieryn in a classic article (1983), in which he traces the emergence of disciplines and debates about authority in the late 19th and early 20th centuries. Such divisions between science and non-science, professional and non-professional, divisions that we take for granted, were formed in historical struggles, and are re-formed in everyday practices: the way

a quoted speaker is introduced, a metaphor used instead of a technical term, a table summarized and simplified.' (ibid)

Therefore, there is another strategy for the popularisation of the concept of self-tracking and for the scientists and engineers to negotiate with the public for adopting the scientific model of prediction in everyday life, that is, the reifications or embodiment of their ideas in QS tools. The new technologies here mainly include the wearable computers (small sensors to collect body data) and smartphone apps (for processing the data and visualising the results). This process of popularisation has been largely spurred by the commercialisation of such novel life-logging practices. Popular QS gadgets that were off-the-shelf on the market included such computerised bracelets as Fitbit, Nike Fuelband and Mi Band, and any smartphones people put into their pockets. They all incorporated various sorts of sensors for collecting human body data. The technology companies thus saved the more generic ICT users the work of DIY design, assemblage and programming, and also made the QS gadgets more affordable thanks to their economies of scale. The cheapest bracelet, Mi Band, made by the same Chinese company Xiaomi that produced my hoverboard, cost only 999 Indian rupees (15.6 US dollars) a piece (http://www.mi.com/in/miband/#01). Meanwhile, those well-funded public companies contributed to raising the awareness of QS through large-scale advertising and continuous promotions to an increasingly larger population of potential users. When Fitbit went public in 2015, the company producing the branded self-tracking bracelets caused a sensation by raising 732 million US dollars at a public initial offering (IPO) in New York, giving itself a valuation of 4.1 billion US dollars. (Bhattacharya 2015) 'Fitbit has sold over 20.8 million devices, as of the end of March. The popular brand's most famous fan is President Obama, who is a fan of the Fitbit Surge. Other celebrities like Ryan Reynolds and Britney Spears have been spotted sporting the Fitbit Flex,' CNNMoney reported in June 2015. It 'sells products in over 45,000 retail stores in more than 50 countries as well as through retailers' websites, their own website and as part of corporate wellness offering.' Its IPO was expected to help Fitbit develop more products and acquire other companies. Fitbit is considered a most successful business case that has hugely benefited from the fad of leading a fitness lifestyle digitally. Consumer electronics giant Apple also released its first Apple Watch in 2015, which incorporated self-tracking functions and a platform for third-party fitness apps. This may have signalled the coming of age of the QS market.

Following the lead of Fitbit and Apple, there arrived a burgeoning of QS apps available for downloading onto smartphones freely or for a small fee, and they could help record such body data as step counts, sleeping patterns, weight loss, records of stoping smoking, diabetes, insomnia and sexual health and performance. For example, Sex Stamina Tester, iThrust and Spreadsheets are apps that measure male performance and gamify sexual activities. The catchphrase during the high days of self-quantification was 'Name anything you want to measure, and there's an app for that.' Because of the affordability and availability of the devices and apps as well as the continuous upgrading thereof, after more than eight years development since the first meetup in 2007, the idea of QS has been accepted by many consumers as well as app and device makers.

The QS's winning over its public audience was also thanks to, arguably, the empirical prediction model itself, which gave rise to the QS movement in the first place. This was because, as mentioned earlier in Section 1.1.1.1, Hume's notions of inductive reasoning and causation for observing human nature were modelled after the Newtonian ones for nature, assuming that nature 'is ever constant with itself,' so the model idealistically presupposed the universalisation of uniform human experience from our past and present to the future. The results from the experiments done according to such a prediction model was less likely to violate a self-tracking device user's expectations about themselves or threaten social norms. Indeed, they mainly served to uncover the habits the user had already formed but might not be aware of, and reveal the social patterns that had already been in existence. These kinds of self-confirming, norm-conforming, self-validating and meaning-making experiments were perhaps naturally welcomed and taken up by an increasing number of QSers. This may be the best strategy for the QS idea's successful propagation over an expansive area and a large population.

Analogically, the analytic philosophy of language also highlights that the wide circulation and use of a language, hence its meaningfulness, depend on following rules and conventions in a language community, irrespective of the nature of that language. (cf Miller 2006,) Indeed, there may not be any innate essence or underlying mechanism of language, meaning or contents of thoughts, but just language in (public) use for collaboration and performing collective acts and tasks. Meaning is a derivative from rule-following. Examples include Ludwig Wittgenstein's later investigation into language games and rule-following, arguing

against the feasibility of a private language, Herbert Paul Grice's cooperative principle and the speech act theory founded by John Langshaw Austin.

However, there is a distinction between the methodology of later-Wittgenstein-inspired linguistics and the algorithm-wielding, number-crunching empirical model of big data (and perhaps also the logical positivism of the early Wittgenstein) for finding patterns. Except for the new breed of computational linguists committed to natural language processing, most conventionalists and pragmatic linguists accept an anti-reductionism account of meaning, which means the properties of mental contents do not reduce to any physical, functional or mathematical properties. (Boghossian 2002: 178-180) Therefore, following this tradition, the applied linguists are tasked with finding out the habitual patterns of language use in certain communities and our society in general without reduction.

Therefore, I argue here that it is the analytical empirical model of pattern recognition and prediction that gives the QS idea legs and the QSers ways and means of safeguarding their jobs and life by helping them staying fit, especially at such a precarious time when humans are removed from the centre of infosphere, when artificial intelligence is replacing human labour in many traditional areas, and when the powerful digital platforms sponsored by Internet leviathans and venture capitals, such as Didi, Uber, Amazon's Mechanical Turk and Starbucks, are ushering in a new sharing economy. In such a platform economy, an increasing number of people are working for gigs without benefits or social security and on radically flexible schedules that stretch them to breaking points. (Kenney, Zysman 2016) Meanwhile, it is also the reductionism to mathematical functions and statistics, which is inherent in most QS apps' and devices' prediction models, that gives rise to some ethical implications, which I will discuss next.

1.2 Ethical implications of QS

As mentioned in Section 1.1.1.2 above, most of the research in artificial intelligence concerning machine learning is dedicated to pattern recognition by mathematical means, and there is a lack of theory to explicate how the machine learns by itself, or what learning processes are involved. Most of the computer science researchers are satisfied with just finding out the right parameterisation method for a desired effect or a required accuracy rate, in accordance with the Humean account of causation. This is perfectly fine for lab research.

However, as the AI and big data technologies have been increasingly applied to many critical domains in human life, from medical diagnosis and treatment to court decision-making and automated driving, there emerges the needs for explanations. For instance, a patient may ask a doctor to explain their decision for a prescription or diagnosis in human-understandable terms. A driver may appeal against a court ruling, seeking redress for a wrongful judgement. In these circumstances, doctors, lawyers, judges and police may find themselves in dilemmas, because their decisions have been made with the assistance of AI, or even completely automated by AI, so they do not know how the decisions have been made. It is all a matter of pattern recognition, and how the computer algorithms find patterns from a cosmic database of precedents mathematically is, up to now, still a mystery in a blackbox.

Although some people would accept nomological explanations, just like non-linguists would accept idiomatic uses and verbal phrases as they are, in democratic societies where citizens deliberate on all sorts of issues, especially on matters immediately concerning the human rights and conditions, it is deontic that the decisions are explicable in human and common sense languages.

Through commercialisation, the QS, which originated as a niche culture of DIYers, has already been incorporated and integrated in the big data business. Most of the off-the-shelf self-tracking devices and apps are also in the big data business network. The detailed body data their users have collected for themselves are also stored by the QS companies for product development but also user profiling. For constructing, maintaining and enriching their digital presence, many QSers themselves also voluntarily share their data on social networks, facilitated or encouraged by the social functions embedded in the apps. It is widely known that such social platforms as WeChat, Facebook, Twitter and Youtube are profiling their users for exploitation, either for commercial purposes or complying with government requirements. The aggregated user profiles, though mostly anonymised, can be mined for patterns in-house or sold to other AI companies for exploitation, probably together with the databases aggregated from elsewhere. In the big data business, the bigger the data the better.

> ‘Contrary to McLuhan’s global village, the internet isolates individuals and fragments demographics (Turkle, 2011), in a consumer panopticon where user activity is constantly recorded and sold for marketing (Schneier, 2014; Neff & Nafus, 2016; Turow, 2017). In the hands of governments and corporations, the internet

> augments efforts to exacerbate asymmetries of information and control, in part by commodifying and exploiting people's self-model (Ferguson, 2017). The primary source of profit for social media is the personal information that individuals exchange (Papacharissi, 2009, 2012; van Dijck, 2013; Martinez, 2016). To increase profits, social media websites conduct research on how to make their platforms more immersive and addictive (Bosker, 2016). Today, the internet funds itself by constructing digital profiles for its inhabitants and dictating consumer-friendly trajectories for their development, through recommender algorithms that tailor advertisements and products. Advertisers bid over personality constructs in massive markets, such as the *digital ad exchange* run by Google, where publishers present the numbers and kinds of individuals they are selling (Turow, 2011). Algorithmic mediations of the self, fueled by the interests of corporate and political power, have undergone an evolutionary transition with the invention and injection of fully simulated selves into online environments.' (Guilbeault, Finkelstein 2019: 154)

Meanwhile, hospitals and pharmaceutical companies are testing with some pilot schemes of incorporating patients' self-monitoring data in treatment and drug development; insurance companies are offering the corporate schemes, in which employees can choose to participate by contributing their own fitness data for insurance discounts; large corporations such as Tesco in the UK have repurposed self-tracking bracelets to monitoring the efficiency of their warehouse workers — Taylorism 2.0.

With so many real and possibly more future applications of self-tracking technologies, we can expect that disputes around such issues as healthcare insurance fees, labour conflicts and identity theft can arise, and people would demand explanations. As a consequence, currently new research are underway to find a way to help explain the rationales behind the results generated by big data and QS technologies. One of my PhD colleagues is researching how to explain to humans the medical diagnoses done by AI on a Chinese online diagnosing platform, for instance. In Europe, there are ethical AI and algorithm design programmes studying how to protect user privacy and make redress possible for AI decisions, including passing new laws such as the General Data Protection Regulation (GDPR), taking effect in May 2018.

1.2.1 The company we keep and social self

The rise of the QS culture can be considered as a digitised extension of the self-culture in modern society, and the influence the QS technologies and discourses have on people's identity building also entails ethical considerations, especially given that the QS gadgets and smartphones are designed to be ubiquitous and always switched on and online, i.e. to be the company we keep all the time. In the 1980s when there was still a large reading public, the American rhetorician and literary critic Wayne C Booth in his book The company we keep: an ethics of fiction argued that the modern society has turned to a self-culture:

> 'Regardless of where we stand on that "obligation outward," our culture seems to talk more naturally about "obligations inward": "self"-cultivation, "self"-fulfillment, "personal growth," "psychic health," "self-change." Instead of trying to combat such (obviously?) self-destructive modes, we may as well begin with our "selves," whatever they are, saving our worries about other people for later on… The chief duty, subsuming all the rest, is to make of oneself the best "character" possible, given one's "circumstances."' (Booth 1988: 166)

Analogically, the QS movement is a new millennium form of self-cultivation, carried out digitally. The rugged individualism is also socially encouraged, palpable in many other areas of social life. My personal experience as a PhD candidate in a British university testifies that the contemporary training of professional researchers has put much emphasis on self-responsibility as well as personal choice (and implicitly personal risks), thereby relieving the university, as a civic educational institution, of its traditional responsibilities to the students as citizens, but also distancing the students from their own social environment and concerns. So the QS movement has arguably moved along with, or even serves to lead and constitute the general direction of mainstream neoliberal culture, despite its origin as a DIY culture, a legacy of the 1960s counterculture movement.

Ironically, many of the hippies in the 1960s had later become the yuppies who were mainly concerned about financial success in the 1980s in the US. Steven Jobs, the late co-founder of the Apple computer company was an epitome, while Burning Man, an ongoing annual counter-culture bonfire festival started in the 1980s in San Francisco, which embraced a syncretism of New Age spiritualities and anti-consumerism, is another case. It is now a popular holiday destination for Silicon Valley billionaires to spend their summers and sums.

Regular attendants include Elon Musk from Tesla Motors and Space X and Google cofounders Larry Page and Sergey Brin and its CEO Eric Schmidt. Google has also incorporated Burning Man in its corporate culture in an effort to 'help to shape and legitimate the collaborative manufacturing processes driving' its growth as well as personal gains. (Turner 2009). Meanwhile, Musk was reported to be among the technocrats to eschew the tent life at Burning Man's dessert venue, 'paying for an elaborate compound consisting of eight recreational vehicles and trailers stocked with food, linens, groceries and other essentials for himself and his friends and family.' The price for eking out a personal oasis for a few days there was 5,500 to 10,000 US dollars per RV. (Carrigan 2015) So the free spirit and solidarity witnessed during the 1960s, such as at the People's Park in Berkeley, California, have been appropriated for commercial purposes, and the counter-cultures from DIY to Burning Man are now, arguably, part and parcel of the mainstream consumerism.[6] Similarly in the UK, some of the major hipster musical festivals such as the Glastonbury Festival, charging only 1 pound (including free milk from the farm) in 1970,[7] are now some of the most expensive artistic events in the country. A full-pass ticket for Glastonbury Festival in 2020 costs 265 pounds plus a five pounds booking fee, according to the festival's official website. Musicians have turned into entrepreneurs, so have our selves.

Despite the society's recalcitrant tendency for navel-gazing and focus on self-sufficiency as well as self-success, Booth insisted on the stance that the self is social, which was against the notion of atomic individualism, because he argued that the self-cultivation cannot be accomplished without the others.

> 'If I think of myself not as an atomic unit bumping other atoms but as a character–as someone doing my best to enact the various roles "assigned" me–I discover that there are no clear boundaries between the others who are somehow both outside and inside me and the "me" that the others are "in." As Gregory Bateson puts it, in that fine, strange, rambling book Steps to an Ecology of Mind (1972), I am not bounded by my skin.' (ibid: 239)

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[6] 'Who would have predicted that less than thirty years after the battle for People's Park, squares and hippies would together create the Californian Ideology? Who would have thought that such a contradictory mix of technological determinism and libertarian individualism would becoming (sic) the hybrid orthodoxy of the information age? And who would have suspected that as technology and freedom were worshipped more and more, it would become less and less possible to say anything sensible about the society in which they were applied?' (Barbrook, Cameron 2001: 366-367)

[7] Official Glastonbury Festival history, https://www.glastonburyfestivals.co.uk/history/history-1970/

Besides siding with the systems theory's point of view that an organism such as a human being is an open rather than a closed system, Booth has also tried to defend the social self view by citing various Marxists, including Marx himself (Marx [1844] 1964: p77; Lukacs 1963; Jameson 1981: ch3), Hegelians (Bradley [1876] 1951: 98-147), behaviourists (Skinner 1969, 1971), social psychologists (Dewey 1922; Mead 1982; Royce 1969), Michael Polanyi (in his account of a 'personal' knowledge pursued by scientists who necessarily live convivially (1972, esp chs 7-8), Charles Taylor (in his account of how the self can fill its responsibility to itself by aspiring to be a different self (1976, 1985)), Joseph Raz (in his defence of liberalism (1986)), Jacques Lacan (in his accounts of how the Subject remakes itself in encounters with the Other (1968; 1978: esp 203-76) and Aristotle ('[W]e are "political animals" precisely in the sense that we become human only in a polis.') (ibid: 238) Therefore, although the QS movement claims to help the QSers gain self-knowledge through numbers, the solipsism and reductionism that come along with it are actually not so conducive to self-cultivation and self-formation, given that the self is social. So unlike the novels that Booth has analysed, which allow their readers to explore and enjoy the fuzzy and ambiguous boundaries between the self and others by giving them licence to play the roles other than their 'authentic selves' (to be discussed in the next section), the self-tracking gadgets and apps the QSers keep as their daily company make them narrowly focus on their own atomic individuals, which, admittedly, can be measured in a variety of innovative and interesting ways. (More on this in Chapter 2.)

1.2.2 QS and role-play

Since self-formation involves playing multiple social roles, Booth (ibid: 255-260) argued that literature can have a significant impact on its readers' character-shaping precisely because it can provide them different roles to play, to be someone different from their 'authentic selves.'

> 'In short, the ideal of purging oneself of responses to persons, the ideal of refusing to play the human roles offered us by literature, is never realized by any actual reader who reads a compelling fiction for the sake of reading it (rather than for the sake of obtaining material for an essay, dissertation, or book). It is of course true that in reading some modern works we take on selves who repudiate tears and laughter and share other human pleasures with the author, pleasures like shuddering at the horrors of the abyss, or mocking sentimentalists, or enjoying textual play of various kinds.

> When we read such works with full engagement, these are our forms of "hypocritical aspiration." Even in the purest of textual gambols we will play the roles–so long as we continue to "listen"–that the text demands of us.' (ibid: 255-256)

He went on to give an account of the poet George Santayana as an evidence, for Santayana's aspirations to be like three great poets in history that he had read (namely, Lucretius, Dante and Goethe) helped shape his character as the Santayana his readers came to know. (ibid: 257)

In comparison, the QS discourse (including show-and-tells, blogs and visualisation of the self-data) can also influence the self-trackers' sense of who they are and their behaviours by inviting them to role-play different selves, which are largely defined by numbers and biometrics this time. However, these roles of quantified selves are mostly digital variations of their own authentic selves, which are situated and embedded in their own everyday contexts and are usually uploaded to the infosphere to create a digital layer of their authentic selves. Thus the QS discourse is rather autobiographical than fictional, and their writers-readers can have many roles to play but within a limited range in their own familiar environment. Even if they read the blogs of another QSer, who has drastically different life experience from themselves, they cannot easily become the narrator like they can in a novel, or take on a protagonist's point-of-view, because the QSers write their blogs from an external and objective perspective with the assistance of the QS machines and data. Therefore, by simply writing-reading the QS discourse, they would not get many opportunities to play the roles of others in totally different or imaginative time-space and socioeconomic situations.[8]

That said, sociologist Deborah Lupton (2012), a leading expert on the QS research, suggested that the QSers are being studied as people seeking to transform their bodies/selves through numbers. Lupton said since the QS technologies have given a self-tracker 'the ability to produce "numbers" measuring aspects of one's life,' they can assess the improvement or progress of their persona enterprise, such as being more productive, wealthier, wiser and healthier, by using hard/objective data. In other words, the QSers take on the roles of different idealised selves, often preconfigured in the apps based on certain scientific models and measurements, and they try to hit the specific numeric targets in order to become those

[8] According to cognitive studies of literature recently, not all novels are equally effective in creating the effects of 'transportation' and 'empathy,' or putting the readers affectively in a character's shoes through tapping into the readers' theory of mind. Some literary novels are better at it than other non-fictions and popular fictions. (Bal, Veltkamp 2013; Kidd, Castano 2013)

roles, rather than, say, imitating the style of a great poet. In this sense, quantification offers an impression of certainty, for how is a self-tracker to know whether they play the roles well or not when they are all by themselves ? As Lupton observed, for the QSers, 'it becomes easier to trust the "numbers" over physical sensations.' (ibid) Thus, she said the self-trackers are those who subject their bodies/selves to scientific measurement by computerised technologies, and are products of, or transformed by, the scientific interpretation by such technologies.

There is also a social, or social-media, dimension to the QSers' role-play, or what Lupton called the 'performative mode' in the QS movement. According to surveillance society literature (e.g. Lyon, 2007), digital technologies are becoming ubiquitous and are used by governments and businesses to monitor individuals. However, the digital technologies are adopted by the QSers voluntarily for their own purposes, such as broadcasting their body data to their friends and followers on social media platforms, such as Facebook and WeChat. Lupton (ibid) said that their voluntary participation in such self-surveillance 'moves from an inner-directed preoccupation with the body/self to a performative mode, inviting further scrutiny from one's friends and followers,' and even comparing and competing with the others' data. For example, many running apps can share a runner's records on social media and invite their friends to compete.

This particular discovery echoes with other research on the development of the Internet and social media in general. In the early days of the Internet in the 1990s, researchers already noticed the Internet surfers were experimenting with multiple online identities, taking advantage of the anonymity engendered by the then new technology. "The most prominent of the early proponents of online voluntaristic forms of identity was Shelly Turkle, who argued that 'you are who you pretend to be' (1995: 192)… However, these 'pretend' identities were not developed in isolation but through interaction with others in the network (Lister et al, 2003: 348)." (White, 2014)

White's (ibid) recent research also showed that the identity changes brought about by the digital media would affect knowledge and usher in a new form of politics. He explained how people have been experimenting and playing with their new-founded online identities made possible by the advent of the Internet, and how they have since formed new communities based on these identity changes.

> ‘[I]dentity is an important factor in the way in which we construct knowledge; changes in identity will, then, impact on knowledge construction. What can be said generally about the move away from identities based on individuality (literate culture) and anonymity (1990s Internet cultures) to ones that are more public in orientation (social networking) is that it subtly alters the relationship between the private and public spheres as traditionally conceived in political theory’ (ibid: 42)

As the Internet has developed into an age of Web 2.0 and with the social media’s arrival on the scene, some novel forms of identity have emerged. What is particular relevant to the QS role-play is what Allison Cavanagh calls a “productive” form of identity (2007: 122, cited in White, 2014: 33-34) In the current new situation, if a blogger or a creator of other types of online content wants to be taken seriously, then they must find ways to convince the potential audience of their credibility. As a result, the game of impersonation and anonymity from the old days are no longer played. Nowadays, the most effective ways to boost one’s trustworthiness online is to make use of social media, which can put a virtual identity in a network of relations, giving it credentials. ‘At the same time, this network of relationships must be grounded in real world identities for it to have a credible foundation.’ (Caldas-Coulthard, 2005, cited in White, ibid) From this perspective, we can see the reason why some QSers publish their self-reports online, share their data in social media and participate in show-and-tells which can later be uploaded is that they are trying to give their new identities and new roles in the infosphere credibility. In Web 2.0 where misinformation can spread quickly through such rumour mills as Twitter, construction of authentic and real identities is a major concern for all the netizens, including the QSers and the POTUS (tellingly, the incumbent US President’s Twitter account name is ‘realDonaldTrump.’)

In sum, just as Booth has carefully studied the novels that keep us company before, it is important, or even imperative, for us to ask now what roles our new QS companions are suggesting and persuading us to play and what types of life scripts and lifestyle patterns the QS discourse is constantly encouraging or nudging us to follow and lead. In other words, what is the cultural model of the Quantified Self ?

2. Literature review

When I first started studying the QS culture in 2013, most of the research was done by sociologists of science and technology studies (STS) and cultural scholars of Internet and new media studies. The linguists and discourse analysts did not pay much attention to this area of development until recently (c.f. Paganoni 2019), although discourse analysts have already dedicated themselves to studying computer-mediated discourse (CMD), including blogs as a genre in general. Therefore, in this chapter I review mainly the work done by the sociologists, anthropologists, political scientists and cultural scholars whose research are related to the QS and big data, and identify the research gap that can be filled by cognitively-informed critical discourse analysts.

2.1 Metrics, panopticon and self-surveillance

As sociologist Lupton (2013a: 25) defined, the QS refers to the practice of regularly self-tracking bodily functions and behaviours, using such digital devices as mobile phones and wearable computers with associated apps, and analysing the statistics thus generated for life-optimisation purposes. The QSers, or self-trackers, use global positioning devices, gyroscopes, altimeters, and accelerometers, branded as many different kinds of consumer electronics products, to collect data on a myriad of lifestyle variables, including 'moods, diet, dreams, social encounters, posture, sexual activity, blood chemistry, heart rate, body temperature, exercise patterns, brain function, alcohol, coffee and tobacco consumption.' (ibid: p25)

According to Lupton (2013a), what is new about the QS are a) coinage of the term "the quantified self" in a bid to categorise those self-trackers who are identified with emerging digital technologies; b) use of media to propagate the QS ideas in a bid to associate new technologies with 'prosumers' and everyday life; and c) the organisation of online communities and physical show-and-tells to share self-tracking knowledge and experiences. (Promsuers are individuals in a Web 2.0 context where people simultaneously produce and consume the user-generated content.)

In particular, wellbeing is an important notion related to the self-quantifying practice, since the QS is not only about physical health but rather, more broadly, about fitness (it is no coincidence that one of the best-selling QS bracelets is called Fitbit). Borrowing from Foucault's (1988: 16-49) idea of the care of the self, Lupton (2012) has called the QS

practices new technologies of the self, in contrast to the other technologies of the self throughout the Western history since the Greco-Roman times. Lupton proposed a perspective that sees the QSers as voluntarily taking on the new self-technologies to achieve self-interest and conform to state objectives at the same time. A QSer then may be considered as a neoliberal 'citizen who needs no coercion to behave productively and in the interests of the state.' (ibid) The QSers need no coercion because 'the controlling mechanisms of software and computer code are hidden thus acting as a subtle form of control,' exerted through 'multiplying the possibilities for controlled freedom' said sociologist Christopher Till (2006), and the subtle control is a feature of 'the societies of control.' (c.f. Deleuze 1992)

This observation about the QS is in line with the general development of the use of metrics in the modern society. As Adkins and Lury (2012) observed, 'the use of metrics in many aspects of social life… has been greatly impelled by the development of technologies for achieving quantification.' When measurements and statistics are already extensively used, accepted as a social institution and reinforced by technologies, their extensions to such areas as the quantification of bodily activities are less likely to be challenged.

This growing trend of getting to know one's self quantitatively (i.e. the QS slogan, 'Self knowledge through numbers') has far more implications on our society than on the QSers' self-(trans)formation alone. Lupton (2012) said that the implications of '[s]uch a transformation extends further… to… the increasing focus on the metrics as a valued source of knowledge in many other aspects of social life.'

Actually, it is not difficult for us to reflect by ourselves how our everyday life in the modern world is permeated and governed by data and measurement, from exam scores in schools to key performance indicators (KPI) in companies to the Research Assessment Exercise (RAE) carried out every five years in British universities (RAE was recently replaced by the new Research Excellence Framework (REF) in 2014, a technological upgrade) to government census. A main and important domain for the universal use of measurement and quantification is in our economic life, from accounting, credit rating and investment decision-making to business and management analysis and insurance.

Indeed, economics since the time of Adam Smith, who also wrote extensively on morality, rhetoric and language, has gradually replaced religion in secular discourse as a central arbiter on value(s) and ethics. According to the sociologists who study quantification and valuation,

the ‘economy enjoys a reputation as the origin and arbiter of value. In almost all domains of life, it is the economist who is called upon to (e-)valuate benefits and costs and provide the basis for decision-making.’ (Kornberger, Justesen, Mouritsen, Madsen 2015: 2-3)

However, it was the first major utilitarian proponent Jeremy Bentham who introduced calculative practices that were able to deliver numbers ‘to quantify pain and pleasure and to use them as inputs in a calculation of utility that results in a clear guidance for decision-makers. In the reframed discussion, calculation replaces the judge, and numbers substitute arguments.’ (ibid: 3)

> ‘What Bentham proposed, and what the economist would put into action, is a new way of thinking and arguing—a new rhetoric (McCloskey 1994)—in which to articulate and justify political ideas. Bentham’s political philosophy—his moral panopticon—can be seen as an implicit critique of justifications of social order, such as Rousseau’s social contract or Hobbes’ imaginary Leviathan. For Bentham, they were nothing but metaphysical niceties that put a form of theatre, an abstract representation, at the heart of society. Bentham replaced this spectacle, which he viewed as corrupt, with a calculation of pain and pleasure. Consequently, the debate shifts from the issue of representations, contracts, and principles to a calculation of grades and degrees. Bentham’s shift poses a costly challenge; it requires an evaluative infrastructure that is able to (or at least can claim to) measure and quantify pain and pleasure adequately.’ (ibid: 4)

Despite that Bentham loathed Hobbes’ and Rousseau’s political and social theories as being like fiction and theatre, his own idea of a panopticon, which he calculated was the most efficient way to run a prison, was also a form of theatre — ‘a play with illusion, a mirage of perspective and lights that would fool prisoners into subordination.’ (ibid: 16)

‘The panopticon is an exemplary prison in which a small number of prison guards watch a large number of prisoners from a central hidden position. The idea of this concept of watching is that because the prisoners are never able to tell when they are being watched, they learn to engage in self-discipline, internalising the guards’ regulatory gaze,’ according to Lupton (2015b: 35). Panopticon has been used as a metaphor for social control by the French historian and philosopher Michel Foucault in his book Discipline and Punish: The Birth of the Prison (1995), which has been influential in surveillance studies, including digital

(self-)surveillance. Panoptic surveillance ‘is a feature of non-coercive disciplinary power involving the few watching the many.’ (ibid: 35) For Bentham, ‘in order to maximize the utility of punishment, it has to be turned into a spectacle,’ which is a fictitious entity, and ‘what people call their own interest (the desire for pleasure and avoidance of pain) is a discursive accomplishment, a fiction, something that comes alive in staged events and theatrical performances.’ (Kornberger, Justesen, Mouritsen, Madsen 2015: 16-17)

So from the standpoint of sociologists, self-tracking is a form of self-surveillance, a voluntary participation in a (post-)panoptic society, and although this participation is arguably utilitarian, it is also fictional, theatrical and rhetorical. ‘In this ?post-panoptic society? (Caluya 2010), coming under the surveillance of others using apps is a largely voluntary practice. What has been described as ?participatory surveillance? (Best 2010) involves the voluntary turn of the gaze upon oneself for one?’s own purposes. Participatory surveillance in relation to self-tracking technologies tends to be implicated with self-reflection and examination [Lupton 2013b]. In this respect it adheres to Foucault?’s (1988) concept of the technologies or practices of the self: those activities that are directed at self-care, self-management or self-improvement.’ (Lupton 2015a) Perhaps like all other fictions, for the fiction of self-care and self-improvement through numbers to work, it is in need of some metaphors. And the conceptual metaphors in the QS discourse will be key to my discovery of the cultural model in QS movement. But before going on to discuss the metaphors of big data and QS in Section 2.3, I will review the literature on idealised selves, metrology and politics of quantification in Section 2.2.

2.2 Idealised selves, metrological chains and politics of quantification

In a sense, the Quantified Selfers are playing the roles of idealised selves measured in numbers. Although some of the QS activists following the DIY tradition may not choose to imitate any celebrity but prefer building their own algorithms (e.g. experimenting with the daily coffee intake and measuring it against mental tasks performance (Fawkes, 2015)), they are still trying to perform idealised roles (e.g. a productive knowledge worker or a scientist), whose sources may come from some idealised examples in popular culture and scientific literature. Certain tendencies in the QS movement which aim to quantify, idealise and rationalise every aspect of a human body may signal an excess of reason, which, as Foucault

(1983a) has argued, will have political consequences. As the French STS expert Latour (1985: 28) pointed out,

> '"Rationalization" has very little to do with the reason of bureau and technocrats, but has a lot to do with the maintenance of metrological chains (Uselding, 1981). This building of long networks provides the stability of the main physical constants, but there are many other metrological activities for less "universal" measures (polls, questionnaires, forms to fill in, accounts, tallies).'

'Metrology is the scientific organization of stable measurement and standards. Without it no measurement is stable enough to allow either the homogeneity of the inscriptions or their return… Thanks to metrological organization the basic physical constants (time, space, weight, wave-length) and many biological and chemical standards may be extended "everywhere" (Zerubavel, 1982 ; Landes, 1983). The universality of science and technology is a cliché of epistemology but metrology is the practical achievement of this mystical universality…Metrology is only the official and primary component of an ever increasing number of measuring activities we all have to undertake in daily life. Every time we look at our wristwatch or weigh a sausage at the butchers shop; every time applied laboratories measure lead pollution, water purity, or control the quality of industrial goods, we allow more immutable mobiles to reach new places.' (ibid)

Therefore, it is due to the development of metrology that those which were once not comparable, which were dispersed in time and space and qualitatively different from each other, have become quantitatively comparable, or commensurable, within a stable and universal metric system, hence being manageable. This is particularly conducive to modernisation, or modern national building, a process in which large-scale projects from railroads to rockets, from hospitals to high-rise buildings, from national schools to national defence, have been done and replicated across the nations and the world, entailing coordination of massive amount of labour and materials of all sorts, often over an extensive period of time. The modern institutions are hence tasked to impose and enforce standardisation and commensuration in order to assure the success of the projects and assess the health of the national economy. Indeed, the metrology itself was a brainchild born from the French Revolution, representing their idealism and passion for modernity.

Nowadays, the metrological systems have continued to develop apace and the International Bureau of Weights and Measures has recently agreed unanimously to replace, or digitise, the physical prototypes of some metric units (e.g. the kilogramme) with mathematical functions, quickening our steps into the digital epoch in all walks of life.[9] The QSers are thus deeply embedded and interconnected with other humans and non-humans alike in this network of universal and standard measurements. They have willingly put themselves in metrological chains, which are constructed, maintained and enforced by the governments and institutions rather than individuals, in exchange for an idealised posthuman life. Their life and standards of living will appear to remain (quantitatively) the same and thus controllable (as qualitative differences are rendered invisible or reduced to the minimum, not under digital surveillance) wherever they go and whenever they are, so long as they stay connected to their self-tracking devices and the Internet, and thus to the metrological network.

For example, when I go jogging in a park wearing my running tracker and heart-rate monitor, connected to a running app (using the metric system) via Bluetooth on my smartphone, which is connected to a 4G mobile network and the Global Positioning System (GPS), I can get the same performance report after jogging as the one I can get from an advanced treadmill in a gym, or even better with more details, nicer graphs and even animation of my own digital tracks on GPS. The difference in my subjective experience, however, between running on a treadmill and a road is not taken into account, not automatically by the devices and the app, at least. As Paganoni (2019: 8) summarised,

> 'Among the tenets of posthumanistic thinking is the vision of the human as embodied and embedded in cultural and technological environments with intelligence and agency distributed between humans and nonhumans (Hollinger 2009)…Rosi Braidotti (2013) sees posthuman subjectivity as a tendency inherent in human and

[9] 'The 2019 redefinition of the SI base units came into force on 20 May 2019,[1][2] the 144th anniversary of the Metre Convention. In the redefinition, four of the seven SI base units – the kilogram, ampere, kelvin, and mole – were redefined by setting exact numerical values for the Planck constant (h), the elementary electric charge (e), the Boltzmann constant (k), and the Avogadro constant (NA), respectively. The second, metre, and candela were already defined by physical constants and were subject to correction to their definitions. The new definitions aimed to improve the SI without changing the value of any units, ensuring continuity with existing measurements.[3][4] In November 2018, the 26th General Conference on Weights and Measures (CGPM) unanimously approved these changes,[5][6] which the International Committee for Weights and Measures (CIPM) had proposed earlier that year after determining that previously agreed conditions for the change had been met.[7]' (https://newsucan2use.com/revised-definitions-of-the-si-base-units-adopted-at-the-26th-general-conference-on-weights-and-measures-cgpm-that-came-into-force-on-20-may-2019/). So what's the fuss all this updating metric units about ? As a Reuters report put it, 'It may not change how you buy bananas, but scientists have voted to redefine the value of a kilogram, in what they called a landmark decision that will boost the accuracy of scientific measurements.' (https://www.reuters.com/article/us-science-kilogram-idUSKCN1NL21P)

> nonhuman living systems alike "to affiliate with other living systems to form new functional assemblages" (Roden 2013: n.p.) and argues that a new notion of the self as networked with capital and communication technologies across real and virtual contexts has emerged, discarding old modernist idealisation of the subject (Goodley 2014).'

As the sociologists of quantification pointed out, to measure and to make commensurate (i.e. to be measured together, from late Latin *commensuratus*) often contribute to valuation and evaluation, which have political and ethical impacts. 'Valuing is a complex process that shapes how we think about the world, one that highlights certain relations and objects but obscures others. Valuing often contributes to making what was once visible invisible, and vice versa.' In institutional settings, valuation is 'transformed through the imposition of rigorous calculative practices… new forms of evaluation changed what people noticed and how they behaved… That which is hard to measure or, for some, that which is most meaningful and deeply integrated into their cultures, or the ethical dimensions of a decision, are often made invisible through processes of simplification and commensuration.' (Espeland, Lom 2015: 19)

'There are some general patterns in how commensuration shapes cognition. It unifies disparate objects or events by imposing a shared metric on them. This may be a shallow form of unity compared with other forms, such as a common identity or common language, but the effect can be profound. One only needs to consider the implications of pricing to appreciate the power of universalizing forms for social relations. But the truly generative aspect of commensuration is that it creates precise distinctions at the same time that it unifies. These distinctions may reflect pre-existing cultural understandings, but their precision is often something new. Precise distinctions force comparisons and stratification. It is impossible not to notice who or what is higher or lower. This attention to difference is fundamental to making judgements about quality.' (ibid: 35)

An example the sociologists cited was university ranking by the media. Seeking for guidance on choosing among a variety of universities and a great range of postgraduate and professional programmes, each of them being a unique opportunity, the students and parents in the US have been persuaded by Morton Zuckerman, the publisher of US News and World

Report, to follow the surveys of certain selected universities and programmes the weekly news magazine has compiled since 1983.

> "[I]t didn't take long for deans of admissions to realize that prospective students were using rankings to decide which schools to apply to and attend. Once newspapers began reporting rankings annually, it was impossible to ignore them…
>
> Rankings have catalysed broad changes in universities. Schools now admit students to boost their selectivity statistics… Millions of dollars are spent on marketing in an effort to boost results from surveys of reputations…
>
> Rankings have redirected our attention in crucial ways. They have created a new status system in which every school has a specific location. Rankings have made winners and losers clearly visible… there is no opting out. Because of the precise relations that rankings create among schools, rankings also reveal 'differences' that may not have existed or may have been invisible. Tiny, insignificant differences, the 'noise' of measurement, may mean the difference between being in the first or second tier, a 'top 100' university or not. Moreover, small, meaningless shifts must now be explained in terms of rankings factors. The things that matter that are not reflected in the rankings become irrelevant…
>
> Most importantly, qualitative differences have disappeared as this new means of sorting has taken hold. Qualities that could distinguish a school, like catering to poor or rural people, specializing in the arts, participating in an experiment to end segregation, or emphasizing teaching, are all back-stage to rankings, and the rankings punish schools for these kinds of innovations—or they are made invisible." (ibid: 27-29)

As this example has tellingly shown, quantification uses the same rod to make commensurate qualitatively different schools and programmes, each of which is a different breed and has its own features and characteristics, and the consequence is that the only indicator for the quality of these schools and programmes has become their ranking status on an ordered list, the higher the better. The qualitative distinctions have been reduced to the bare minimum, while numbers and statistics reign supreme, causing unnecessary but inevitable anxieties and misrepresentation.

The same can be applied to the QSers. When they use their self-tracking apps, they also apply the embedded shared metrics, such as cadence and heart rate, to their docile bodies, thus putting their bodily activities to be compared on the same objective list with the others'. Some QSers may enjoy this feeling of competition, while others may find devious ways to game the system.[10] Nevertheless, what matters is that their attention has been redirected to things more quantitative, limiting their conceptualisation about their own fitness and self-improvement. No matter winning or losing, they are focused for a while everyday on step counts and body weights, for instance, instead of on some other meaningful aspects about how fit they are, such as whom they have helped and what new things they have learnt. Sometimes, they may be misdirected by their apps to focus on some popular but insignificant measures (e.g. body mass index (BMI) instead of cardiovascular health), or sometimes, the measurements done by their consumer-grade micro-monitors are not accurate enough to generate medically significant results. (I was once scoffed at by my physician when I tried to show her my sleep quality recorded by my app. She kindly suggested that I should check out the hospital's polysomnography.)

An 'important pattern in quantification is that we are more likely to emphasize that which is easiest to measure. The algorithm USN used to create rankings included measures that schools routinely collected. For example, students' satisfaction with their school was operationalized as the percentage of students who donated to their university. This clearly benefits schools with wealthy students compared to those with poorer students. Rankings criteria also include the statistics that schools routinely collect, such as test scores and grade averages. The quality of libraries is measured by the number of their books.' (Espeland, Lom 2015: 35)

For the QSers, the easiness of measurement also depends on the functionalities, or technological affordances, of their smart devices. For example, the reason why most of the fitness and weight control apps use the inaccurate metrics of BMI is not only because the index is popular and conventional but also because the majority of the smartphones do not have sensors for measuring cardiovascular health and total lung capacity, which are medically more accurate. Of course, there are always add-on sensors and QS accessories for the

[10] WeChat has a popular social function for comparing users' daily step counts, encouraging them to exercise more often. However, some online vendors have taken the opportunity to sell smartphone holders that can shake or rock the phones automatically, thus cheating the system for steps and helping the users boost their rankings.

enthusiasts to experiment or play with. For cost-benefit reasons, however, most app makers vying for mass consumers may not take special hardware add-ons into the consideration of their default app designs, especially when the hardware needs to be custom-made or is supplied by a third-party, which they cannot control.

As mentioned earlier in this section, the QSers are empiricists in their approach but idealists in aspiration for universality, or even immortality.[11] This has caused debates among the QS researchers. Sociologists have studied the QS for some time, and they differed on what sorts of social logic it represented. Lupton (2012) claims that a QSer should be considered as a neoliberal 'citizen who needs no coercion to behave productively and in the interests of the state'. They buy into the state apparatus' control through accepting the metrics and the imposition of metrological chains on their own volition. Perhaps there is also a smack of cosmopolitanism that affects the QSers positively, since the Quantified Self is considered an international movement with a distributed network of local meetup groups in the major cities of the more developed regions. That helps explain why some people willingly participate in this movement. Actually, cosmopolitanism has always been a magnet since modernity to draw the people who aspire to be 'citizens of the world' into such social movements as Bloomsbury Group.

Meanwhile, Nafus and Sherman (2014: 1785, 1790-1792) considered the QS as a form of 'soft resistance,' 'an important modality of resistance to dominant modes of living with data,' because the self-trackers challenged and disrupted the traditional modes of data aggregation by their idiosyncratic data gathering practices and often shifting priorities.

All of the above sociologists' arguments have their own merits, based on their respective surveys and interviews with the QSers, yielding objective accounts of the QS movement from various perspectives. However, my research was carried out using a cognitive linguistics approach, focusing on identifying the conceptual metaphors in the QS community and, by inference, the cultural models of the Quantified Self. In my case, the QSers could be 'neoliberal citizens' who voluntarily conformed to state objectives or the people who put up 'soft resistance' to the corporate and scientific hegemony, or mixed with both.

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[11] Some of the posthumanists have proposed the idea of uploading their brain data, such as brainwaves records, their equivalent to consciousness, into the cloud, so in the future when technologies become sufficiently advanced, scientists can download their consciousness from the cloud into an artificial human body, hence immortality.

Unlike the sociologists who study the QS through interviews and surveys, I choose to examine QS blogs, aided by cognitive linguistics theory, which returns the materiality to language. By the materiality of language I mean that, while sociologists consider language as a means of conveying ideas, cognitive linguists insist that the way we use language and construct a phrase directly reflects our thoughts, rather than language mediating them. According to Conceptual Metaphor Theory, clusters of linguistic metaphors (or metaphorical expressions) can reflect the underlying concepts in people's mind and reveal the hidden beliefs they hold. (Lakoff, 2007, 1990; Lakoff, Johnson, 1999, 2003) By close reading the QS blogs, I am looking directly at some of the QSers' explicit and implicit thinking patterns, the same as gesture scholars looking at people's gestures and infer about their thoughts. More specifically, I research the QS conceptual metaphors related to *self, data* and *self-control*, which is a critical component of the contemporary conceptualisation of wellbeing.

2.3 Blogs, cultural models and metaphors of big data

As mentioned at the beginning of this chapter, few linguists have paid attention to the discourse of the Quantified Self, except for Paganoni (2019) and Jones (2015), so this is a quite new topic for linguistics and discourse analysis. Furthermore, as far as I know, no linguist or discourse analyst had systematically examined the relations between the QSers' discourse and their mind, or the cultural models of Quantified Self. [12] Since I was interested in studying the QSers' subjective experience rather than studying how the public perceived the QS movement, I have chosen to analyse the QSers' show-and-tells blogs instead of the news coverage of QS.[13]

2.3.1 Blogs as a type of computer-mediated discourse (CMD)

Linguists have studied blogs for some time, as a subgenre of the computer-mediated discourse, and I here offer a brief overview in relation to my research on QS blogs, mainly with reference to Baym (2006) and Herring and Androutsopoulos (2015).

The study of computer-mediated discourse (CMD) is 'a specialization within the broader interdisciplinary study of computer-mediated communication (CMC), distinguished by its focus on *language and language use* and by its use of methods of *discourse analysis* to

[12] For a detailed discussion of the Quantified Self culture in relation to selfies and blogs, see Rettberg (2014: 61-78).

[13] Paganoni (2019: 21-58) studied the English news coverage of big data in order to analyse 'the strategies deployed in the construction and dissemination of expert discourse about big data.'

address that focus.' (Herring, Androutsopoulos 2015: 127, original emphases) The academic interest in how humans use language to communicate on the Internet began in late 1970s (e.g. Hiltz and Turoff 1978), and researchers including linguists, communication scholars and sociologists have since studied mainly two types of computer-mediated communication (CMC), namely, synchronous CMC and asynchronous CMC. The former includes chat rooms, instant messaging, online games, MUDS (multiuser dimensions or multiuser dungeons), and the latter includes email, static websites, webboards, bulletin boards, newsgroups and weblogs (or 'blogs'), though in practice the lines between the two are often blurred. (Baym 2006: 523) In terms of CMD, the first research was conducted in the 1980s (Murray 1985, 1988; Severinson Eklundh 1986), 'but language scholars did not begin to take serious notice of CMD until 1991, with the publication of Ferrara, Brunner, and Whittemore's "Interactive written discourse as an emergent genre."' (Herring, Androutsopoulos 2015: 127) Scholars, who noted that speech and writing are not dichotomous but rather are situated along a continuum (see Biber 1988), 'have distinguished between synchronous and asynchronous CMD, situating asynchronous modes such as email closer to the written end of the written–spoken continuum than synchronous modes such as chat, which tend to exhibit more "oral" features.' (ibid: 129)

Alternatively, CMC can be categorised as text-based and multimodal. (ibid: 127) In text-based CMC 'messages were typed on a computer keyboard and read as text on a computer screen – and accessed through stand-alone clients. Text-based CMC modes include email, discussion forums, newsgroups, chat, MUDs and MOOs (MUDs, object oriented), blogs, microblogs, and wikis.' As the Internet entered into the age of Web 2.0, textual CMC has been increasingly supplemented by graphical, audio, and/or video channels of communication, and multiple modes of CMC are available on Web 2.0 platforms and smartphones. 'All of these environments provide rich contexts in which to observe verbal interaction and the relationship between discourse and social practice.' (ibid: 127)

Specifically related to my research, the blogs are *a type of online discourse*, in which 'a writer or collective of writers posts comments on a daily or even hourly basis. Readers can often engage in discussion of those comments through hyperlinked sections that appear as second pages.' However, the degree of interactivity a weblog offers varies, 'depending on

whether the author includes the means for readers to leave comments or reply to those comments that are left.' (Baym 2006: 523)

According to the linguists, CMD types and genres can be classified in familiar terms, 'particularly when these are viewed not so much as fixed sets of features than as responses to common communicative exigencies, as suggested by Giltrow (2013). For example, the blog (sub)genres of filter blog and personal journal recall the offline genres of journalistic commentary and diary, respectively (Herring *et al*. 2004).' (Herring, Androutsopoulos 2015: 129)

Forms of CMC are often compared to other forms of language use, such as face-to-face communication (the usual standard for comparison in CMC research), telephone calls, and traditional letters. By comparison, CMC offers three empowering and democratising advantages. First, the 'ability for each Internet user to communicate one-to-many is an unprecedented transformation in the landscape of communication media, which have historically limited this capacity to a small number of influential mass media producers.' (Baym 2006: 523) Each QSer can talk to an unlimited number of fellow QSers and others through their blogs.

Second, computer mediation can also greatly increase the opportunities people have to use language with those far away. 'In strong contrast to face-to-face interaction and to a lesser extent the telephone, computer-mediated language media seem to transcend space. So long as people are online, messages exchanged across continents are indistinguishable from those sent between rooms in the same building, both in form and speed of transmission. This can create a sense of being close to one another.' (ibid: 524) In this way, the online presence of QS websites, mailing lists, forums and blogs can contribute to knitting the QSers, who are geographically dispersed, closely together as a community.

Third, '[b]y virtue of being electronic, computer-mediated language can be stored and replicated.' However, storing and archiving examples of online language use has proven to be a difficult logistical challenge, because the cyberspace is constantly changing as everyone uploads, deletes and updates their online contents as they like all the time. (The 2014 film The Maze Runner serves as a good visual metaphor for this.) 'Computer-mediated language sites that are present one day may be gone or transformed the next.' (ibid: 524) That is why

when collecting blogs data for my corpus construction, I saved a copy of each selected blog page on the spot, and used the copies as the sources for my QS blogs corpus.

Researchers have also identified a continuum from lean CMC to rich CMC. ‘CMC media differ in richness (Daft and Lengel 1984), or the extent to which nonverbal cues are apparent,’ such as the ability to format messages by varying fonts and colors and embedding images, sounds and hyperlinks. Text-based forms of CMC is often leaner. (ibid: 524) Given that I did corpus-assisted discourse analysis and my corpus tools AntConc and ProtAnt only accepted txt-format files, I had manually deleted all the nonverbal cues from my QS blogs.

The languages used in CMC, overall, resemble a hybrid of writing and speaking (particularly English, French, Swedish, and Norwegian). (Baron, 2000; Baron and Ling, 2003; Baym, 1996; Danet, 1997; Ferrera et al., 1991; Hardaf Segerstad, 2005; Herring, 2001; Ling, 2005). CMC is like writing in many ways. For example, the text usually bears an address; messages can be edited prior to transmission; the author and reader are usually geographically (and often temporally) separated; messages can often be read by anonymous readers who may not respond. Vocabulary, syntax, spelling, and the use of uncontracted forms may make online interaction more like writing than speech. (ibid: 526)

“On the other hand, there are many ways in which online language better resembles speech. Messages are generally related to prior ones, often through turn-taking, although disrupted turn adjacency and lack of feedback can render turn-taking challenging (Herring, 2001). Messages are based in a relationship between writer and reader. There is often a history of shared referents and speech conventions (e.g., Hymes, 1986)… Furthermore, online language can be marked by colloquial and nonstandard spellings that foreground phonetic qualities (e.g., ‘gotta’ instead of ‘have to’).” (ibid: 526)

‘Ultimately, many scholars conclude that online language is an ‘‘interactive written register’’ (Ferrera et al., 1991), hybrid (Danet, 1997), creole (Baron, 1998), or ‘‘uncooked linguistic stew’’ (Baron and Ling, 2003) that blends elements of written and oral language with features that are distinctive to this mediu.’ “Among the most commented upon features of online writing are the use of abbreviation (e.g., TTYL for ‘talk to you later’), the use of asterisks as brackets to simulate underlines, and upper case lettering to indicate emphasis. A number of deletions have also been noted, including the deletion of subject pronouns (e.g.,

‘gotta go now’), vowels, and punctuation.” (ibid: 526) These linguistic properties have also been observed in the QS blogs.

In terms of CMD’s discourse structure, Herring and Androutsopoulos (2015: 131) observed, ‘Some of the most iconic properties of computer-mediated language are structural features at the sentence level and below: creative and non-standard typography, spelling, word-formation processes, and syntax. A recent overview of such features can be found in Herring (2012).’

‘People often produce grammatically correct sentences in textual CMD, especially in asynchronous modes such as email (which allow more time for editing) when the writers are well educated, the purpose of the communication is professional, and the tone is serious. Yet deviations from standard sentence structure also occur often – elided elements, missing or incorrect capitalization and punctuation, sentence fragments, and so on. Thus it makes sense to consider “utterances,” rather than “sentences,” as the basic units that constitute and combine to form messages in CMD, where utterance is defined as a sequence of one or more words that is preceded and followed by silence (space) or a change in communicator.’ (ibid: 131)

An interesting area of CMD research is the study of the writer-speaker’s attitudes and sentiments through word count. ‘The choice, frequency, and distribution of *words* can indicate what a segment of discourse is about (topicality), as well as communicators’ attitudes and affective states. For example, Cohn, Mehl, and Pennebaker (2004) compared LiveJournal bloggers’ affective and psychological states before and after the events of 9/11 using the LIWC (Linguistic Inquiry and Word Count) data-analysis tool… Automated tools such as LIWC enable large samples of text to be mined for meaning at minimum cost.’ (ibid: 134)

Although LIWC is a powerful tool, it was designed for a different purpose from mine, that is, to test attitudes and sentiments rather than identifying conceptual and cultural models. Theoretically, LIWC drew from psychometrics and personality theories, rather than Conceptual Metaphor Theory and cognitive and cultural anthropology.

Researchers also draw from Speech Act Theory to study intentions in CMD. ’People interacting via CMD also produce meaning intentionally, via utterances that aim to convey a particular illocutionary force (see Searle 1975).’ (ibid 134) In order to learn how people signal their intentions, the researchers have turned to analysing the speech acts used in CMD.

Herring, Das, and Penumarthy (2005) proposed a coding scheme consisting of 16 "CMC acts," which they claimed could be used to analyze all types of CMD. 'Each act – roughly the semantic equivalent of a structural utterance – is further classified according to whether it expresses the utterer directly or the speech/thought of someone else, and whether the act is bona fide or non-bona fide (e.g., humorous, ironic, sarcastic, deceptive). Thus in CMD, as in speech, illocutionary acts mirror the message producers' communicative goals.' (ibid 134)
Intertextuality, manifested through implicit cultural references, is another feature in CMD. 'CMD users incorporate outside context to create meaning by paraphrasing, quoting, retweeting, or linking to other texts elsewhere on the Web,' afforded and facilitated by the multimedia and interactive technologies of Web 2.0. (ibid: 136)
Since the QS is considered as a social movement and community, it is also worthy of mentioning 'research on CMD as social practice.' Research in this direction 'started with exploratory work on computer-mediated interaction and community in the 1990s (e.g., Baym 1995; Cherny 1999) and was consolidated in the 2000s as a "second wave" in linguistic Internet studies (Androutsopoulos 2006), which coincided with the broader turn to language practices in socially oriented linguistics. The social aspects of CMD are shaped by the progressive digitization of society and the embedding of digital communication technologies in everyday life, along with the medium and situation factors… The very distinction between offline and online communication is now increasingly fuzzy, as people are "always on" (Baron 2008). One impact of these changes on CMD research has been a turn from discourse in virtual communities as separate social entities to digital language practices that mediate between offline and online practices by individuals and communities.' (ibid: 138)
Self-presentation is one of the more important social functions of the Internet. The CMC, due to its empowering, enabling and democratising nature, as mentioned above, has actually encouraged the development and innovation of self-expression and self-presentation in the cyberspace. Everyone can have a megaphone on the Web, and there is a burgeoning growth of avatars in all areas of the Web, from online games to online forums and social networks. 'The locus of research on individual self-presentation in CMD has shifted since the 1990s from personal homepages to blogs to social network sites. Blogs commonly present an individual blogger's thoughts and feelings and adopt a first-person perspective (Herring *et al*. 2004), although Puschmann (2013), contrasting what he terms the "author-centric" and the

"topic-centric" styles, shows that the purposes of blogging influence audience design, style, and content.' (Herring, Androutsopoulos 2015: 140) Given that QSers' blogs were mainly about their own self-tracking experience, they were more 'author-centric' than 'topic-centric.' (c.f. Puschmann 2013: 98-102) However, the picture is not so clear or straightforward, as the QSers' blogs also exhibited certain properties that are typically 'topic-centric,' such as their expository mode when they tried to give others instructions on how to carry out, or explain how they did, a self-experiment. Some of them also served as partially self-narration and partially products reviews. Many of the QSers also use their real names instead of pseudonyms in their blogs for the purpose of presenting themselves as credible and authentic, and this is especially a salient feature, given the consideration that the QSers would also regularly meet each others offline.

As Puschmann (2013: 100) said, 'Fluidity of purpose (and, resulting from this, fluidity of style and content) is endemic to blogs, and therefore a wide area of intermediate forms of use lies between the two extremes. The distinction between topic-centric and author-centric styles is not intended as a clear-cut system of categorization, but rather as a way of systematizing the different audiences and intentions that bloggers associate with their activity.'

'CMC technology continues to innovate at a rapid pace, and new and up-to-the-minute research is needed to document its appropriation and consequences for discourse. For example, we can anticipate structural and cultural changes in online communication as smartphones and other portable devices enable ubiquitous mobile access to the Web.' (Herring, Androutsopoulos 2015: 143)

2.3.2 Cultural/folk models

Both cognitive linguists (e.g. Kovecses, Lakoff 1987; Sweetser 1987; Kövecses 1986) and cognitive/cultural anthropologists (e.g. Quinn 1987; D'Andrade 1987; Strauss, Quinn 1997) have made use of the schema theory and cultural models (also known as folk models) to analyse and describe a group of people's subjective cultural experiences and understandings.

'The idea of cognitive models was introduced by Kenneth Craik in the 1940s in his book, *The Nature of Explanation*. Craik stressed the use of models in thinking:

> If the organism carries a "small-scale model" of external reality and of its won possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situation before they arise, utilize the

knowledge of past events in dealing with the present and future, and in every way to react in a much fuller, safer, and more competent manner to the emergencies which face it. (1943: 13)' D'Andrade (1995: 151)

According to D'Andrade (ibid: 151), a model 'consists of an interrelated set of elements which fit together to represent something. Typically one uses a model to reason with or calculate from by mentally manipulating the parts of the model in order to solve some problem. Every schema serves as a simple model in the sense that it is a representation of some object of event.' For example, the schemas of *commercial transaction* and *the real self*. More specifically, a *schema* refers to 'the organization of cognitive elements into an abstract mental object capable of being held in working memory with default values or open slots which can be variously filled in with appropriate specifics.' Within the schema theory, a *prototype* refers to 'a typical example of a type of object capable of being held in working memory, often with many properties "chuncked" together to form a rich, specific image. For example, a *robin* is a prototypic bird, a *penguin* is not. A prototype is the instantiation of a schema.' (ibid: 179)[14]

However, D'Andrade (ibid: 152) also pointed out that many models are not schemas themselves, but are composed of schemas. 'Models are not schemas when the collection of element is too large and complex to hold in short-term memory (by definition, a schema, as a "bounded, distinct, and unitary representation," must fit into short-term memory).' Meanwhile, cultural models, which are implicit, are differentiated from cultural theories, which are more general, overarching and loosely defined, and are formulated as 'explicit declarative knowledge.' (ibid: 180) 'A cultural theory consists of an interrelated set of propositions which describe the nature of some general phenomena,' such as the theory of evolution and the Aristotelian theory of essence. (ibid: 172) And 'a proposition is the sense of something said about something (typically a sentence) and involves the integration of a

[14] In relation to language, each word, or lexical unit, is an instance of schematic encoding. For instance, the utterance 'the cat is on the mat' includes the schemas not only for *cat, on* and *mat*, respectively, but *is* and *the,* respectively. The lexical units are schematic, or abstract, mental representations, since they lack specificity (e.g. Whose cat ? What's her name ? Which breed or pedigree ? When was she seen on the mat ? Why was she there ? Where was the mat ?) thanks to layers of abstraction from the particulars in reality to universals. Thus, they can serve perfectly as labels or containers for conceptual categorisation, which include an innumerable number of particulars across space and time. As long as the contents of these labels or containers are held constant across a speech community (though they can always be contested, from *desk* to *democracy*, especially in politics and academia), they can serve as tools for facilitating human collaboration and communication in the community. (C.f. Lakoff's (2008a: 177-189) discussion on 'Contested Concepts Everywhere.'

relatively small number of separate schemas into a more complex schema; a proposition asserts the relation between this integrated schema and he world.' (ibid: 180)

'Several things distinguish cultural models from cultural theories. First, the propositions of a culture theory are statements which are made by the natives, unlike the propositions of many cultural models, which are typically assertions by the analyst of the way people represent something based on the way they reason or their understanding about it, or which is implicit in what they say about it. While the knowledge which makes up a cultural model often is procedural in character, a cultural theory is made up primarily of declarative knowledge, which means that one can ask directly about the phenomena in question and receive direct answers. Also culture theories are often about very general and abstract topics, like the origin of life or the character of the supernatural, and the propositions which describe this topic may be only loosely related to each other.' (D'Andrade 1995: 172-173)

Accordingly, my research of the QSers' conceptualisations of their selves aimed to identify their cultural models, rather than theories, from the language they use.

2.3.2.1 Lexical, textual approach to cultural models

Kövecses (1986: 1) has proposed a lexical approach to folk models and the structure of concepts, which can also be applied to my case, because I did not have the resources to have deep interviews with my research subjects. "Since it would be impossible to have deep interviews with every member of a speech community in the search for the structure of particular concepts associated with particular aspects of the world, we have to resort to a more practicable method. Although we cannot interview everyone, we can probe the language used by everyone. Since the goal is to get at our conceptual system, and the folk models within this system, through the lexicon of the English language, we can call such a method a 'lexical approach' (cf. Verschueren 1985). The various folk models corresponding to various areas of experience can in turn be called 'language-based' folk models."

"This lexical approach to our conceptual system can be regarded as a continuation of some respectable traditions in the study of cognitive systems. One tradition I have in mind is what is called 'linguistic analysis' as represented in the works of Wittgenstein (1963), Austin (1961), Ryle (1949) and others. These philosophers use ordinary language for discovering subtle conceptual distinctions among such philosophically interesting categories as 'action', 'meaning', 'mind', 'emotion', etc. The other tradition comes from ethnography and

anthropology. Ethnographers and anthropologists who are interested in the cognitive systems of various peoples look at language as an important tool in the job of learning about these cognitive systems. Researchers in this area owe a great deal to the pioneering work of Sapir (1949) and Whorf (1956). One of the most influential recent advocates of this methodology, Charles Frake, sees the role of language in this connection in the following way:

> "The analysis of a culture's terminological systems will not, of course, exhaustively reveal the cognitive world of its members, but it will certainly tap a central portion of it. Culturally significant cognitive features must be communicable between persons in one of the standard symbolic systems of the culture. A major share of these features will undoubtedly be codable in a society's most flexible and productive communicative device, its language" (in Dil(ed.)1980:3). (ibid: 1-2)

Similarly, in anthropology, schema analysis is also an established approach and constituent part of text analysis for studying cultural models. (Bernard 2011: 439-443; Wutich, Ryan, Bernard 2015: 539-541) 'Everyday life—to say nothing of special situations, like major rituals—is just too complex for people to deal with one scene at a time. There must, the reasoning goes, be some rules—a grammar—that help us make sense of so much information. These rules comprise schemas (Casson 1983:430),' said Bernard (2011: 441). 'When many people in a society share a schema, then the schema is cultural. How can we learn about cultural schemas? Most anthropologists do this by analyzing narratives.'

A classic example of textual schema analysis in cognitive cultural anthropology is Quinn's series of studies about the American marriage schema. Quinn interviewed 11 American couples about marriage, and analyzed the interview transcripts 'to discover the concepts underlying American marriage and to show how these concepts are tied together—how they form a cultural schema, shared by people from different backgrounds about what constitutes success and failure in marriage (Quinn 1982, 1987, 1992, 1996, 1997).' (ibid: 441)

Quinn drew inspiration from the Conceptual Metaphor Theory and took it further. She treated the conceptual metaphors as proxies for analytical themes, and deduced the schemas, or underlying principles, that could produce those metaphors. 'For instance, Quinn's informants often compared marriages (their own and those of others) to manufactured and durable products (''It was put together pretty good'') and to journeys (''We made it up as we went along; it was a sort of do-it-yourself project''). And when people were surprised at the

breakup of a marriage, they would say things like ‘‘That marriage was like the Rock of Gibraltar’’ or ‘‘It was nailed in cement.’’ People use these metaphors because they assume that their listeners know that cement and the Rock of Gibraltar are things that last forever.’ (ibid: 441-442)

Quinn reasoned that ‘if schemas are what make it possible for people to fill in around the bare bones of a metaphor, then the metaphors must be surface phenomena and cannot themselves be the basis for shared understanding. She tries to understand how metaphors group together and finds that the hundreds of metaphors in her enormous corpus of text all fit into just eight classes: lastingness, sharedness, compatibility, mutual benefit, difficulty, effort, success (or failure), and risk of failure.’ (ibid: 442)

An important insight from Quinn’s study of the cultural schemas of marriage shard by the American people (i.e. the colonialists from Europe and their descendants) throughout the US history was that the concepts of success (in marriage but also in the American life in general) and self-reliance are historically linked. Quinn (1997: 281, n32) quoted James Oliver Robertson as saying,

> ‘Success—survival—was the measure of fitness. Success had long been, for Americans, a moral goal. The Puritans had brought with them, later Americans believed, the idea that success was a sign of God’s Grace, a sign that the successful individual was one of the elect. That aura continues to cling to the vision of success. For the social Darwinists, success was a sign that the racial and moral character of the individual was the highest. If successful Americans could no longer claim to be among God’s elect, they could still claim to be among nature’s select. It was the individual who triumphed over competition, who succeeded by hard work, careful self-training, and eye to the main chance, the luck to be in the right place at the right time, and who had the versatility to grasp opportunity. The jack-of-all-trades, sturdy, independent, free American could not have been improved upon, in the imagination of most Americans, as a fit survivor. Horatio Alger’s heroes were such survivors, and there have been few American heroes or heroines since Alger whose success was not a result of natural selection (Robertson 1980: 290).

The ethos of this kind of rugged individualism and survivor mentality[15] is arguably well and

[15] Perhaps not coincidentally, Survivor is also the title of an international competition reality TV show, which is popular in the US, running on its 38th season now since premiering in 2000.

alive in the QS movement, which is mainly about personal fitness to work hard and lead a good life, and such fitness relies on a QSer's self-cultivation (self-training, self-monitoring and self-discipline) and resourcefulness in carrying out self-experiments (or paying for and playing with different kinds of QS gadgets and tools.)

As Quinn (ibid: 281, n32) also noted, 'While Robertson views success and independence as joined in the individualism popularized by social Darwinism, another writer, Loren Baritz points to the "difficult success" of the pioneer experience as shaping the distinctive American brand of individualism that stresses hard work and independence (see also Bellah et al. (1985:148-149):

> To the pioneers, individualism was a fact of life, not a prejudgment or a theory. Whereas for the Puritans individuals was a postulate deduced from their theology, for the pioneers it was a position induced from their daily experience. Living in perhaps dangerous isolation, threatened with destruction if he stepped wrong, the pioneer, whether he flourished or failed, had only himself to thank or blame. For him, success came from self-reliance and independence was proof of virtue (Baritz 1982:5)

Next I will review the literature on the cultural model of the self.

2.3.2.2 Scientific and cultural models of *self*

Contrary to everyday cultural (folk) belief, neuroscientists have found that there is no such a thing as the self (i.e. an essential, unified core entity as conceived in common sense). Some philosophers and buddhists have also contemplated on the problem of self, and came up with such conceptualisations as bundles of sensations and experiences and no-self.

'This daily experience of our self is so familiar, and yet the brain science shows that this sense of our self is an illusion. Psychologist Susan Blackmore makes the point that the word "illusion" does not mean that it does not exist — rather, an illusion is not what it seems. We all certainly experience some form of self, but what we experience is a powerful deception generated by our brains for our own benefit.' (Hood 2012: ix)

However, 'there is a real difficulty in discussing the self illusion…the terms *I, me, my, mine, you, yours, our, us,* and *we* are used, which all imply the existence of a self or multiple selves…You might conclude that the premise that the self is an illusion must be false because these terms already acknowledge the existence of the self in the first place. The problem is

that there is no simple way around discussing the self without using these words that refer to this human experience most of us have.' (ibid: ix)

Hood (2012: x) pointed out that there were two types of self theories. The first kind, known as 'ego theory,' represents what most people think the self is, the folk or cultural model. (Philosopher Galen Strawson calls it metaphorically the 'pearl view' of the self). According to the ego theory of self, an average person in the street would most likely describe their self as the individual who inhabits their body.

> 'They believe they are more than just their bodies. Their bodies are something their selves controls. When we look in the mirror, we regard the body as a vessel we occupy…This pearl view is the common notion that our self is an essential entity at the core of our existence that holds steady throughout our life. This ego experiences life as a conscious, thinking person with a unique historical background that defines who he or she is. This is the "I" that looks back in the bathroom mirror and reflects upon who is the "me."' (ibid: x)

'In contrast to this ego view, there is an alternative version of the self, based on the "bundle theory" after the Scottish Enlightenment philosopher, David Hume. Three hundred years ago… [Hume] tried to describe his inner self and thought that there was no single entity, but rather bundles of sensations, perceptions, and thoughts piled on top of each other. He concluded that the self emerged out of the bundling together of these experiences. It is not clear whether Hume was aware of exotic Eastern philosophy but in the sixth century BC, thousands of miles away in much warmer climates, the young Buddha, meditating underneath a fig tree, had reached much the same conclusion with his principle of *anatta* (no self). Buddha was seeking spiritual rather than intellectual enlightenment and thought that this state could only be achieved by attaining *anatta* through meditation.' (ibid: x-xi)

Hood (ibid: xi) pointed out that contemporary brain science, or neuroscience, has found much evidence 'to support the bundle theory as opposed to the ego theory of the self.'

The scientific discoveries about the nature of self are mainly threefold. First, who we are depends on our brains, but we are not just our brains in isolation. Each brain exists in an ocean of other brains that affect how it works. Second, there is no center in the brain where the self is constructed. The brain has many distributed jobs. Although it appears that when we are looking at paintings and listening to music, we do these under the guise of a self, the

sense of self that most of us experience is not to be found in any one area. Rather it emerges out of the orchestra of different brain processes like a symphony of the self, just as Buddha and Hume said. Third, our brain constructs models of, or simulate, the external world. It can weave experiences, with incomplete information, into a coherent story that enables us to interpret and predict what we should do next — an evolved survival strategy. Who we are is a story of our self — a constructed narrative that our brain creates. Some of that simulation is experienced as conscious awareness that corresponds to the self illusion that the average person in the street reports. (ibid: xii-xiii)

'Dan Dennett also thinks the self is constructed out of narratives: "Our tales are spun, but for the most part, we don't spin them; they spin us." There is no self at the core. Rather, it emerges as the "center of a narrative gravity."' (ibid: xiii)

This narrative or constructive theory of self helps throw light on our understanding of the Quantified Self from a scientific perspective. In order to integrate into the human society, through learning and socialisation, we continually develop our sense of self from childhood on and elaborate our self narratives in an effort to learn and adapt to different situations. 'Sometimes we even describe our self illusion as multifaceted, as if we have the work self, the home self, the parent self, the political self, the bigoted self, the emotional self, the sexual self, the creative self, and even the violent self. They seem to be almost different individuals but clearly there is just one body.' (ibid: xv) So these different aspects and facets of the self are the different stories we tell about ourselves, consisting of respective scripts, schemas and cognitive models, for us to deal with respective social situations. Arguably, these self-narratives can be constructed verbally but also digitally through measuring and monitoring our bodies with self-tracking tools. So the QS apps and devices are a type of self-narrative generator, assisting the QSers in managing their social situations.

Counter-intuitively, according to the neuroscience model of self, it is not us who switch between our different selves. There is no individual doing the switching. 'That's part of the illusion. There is not one self or multiple selves in the first place. Rather, it is the external world that switches us from one character to another. This idea that we are a reflection of the situations is sometimes called the "looking-glass self" —we exist as the reflection of those around us.' (ibid: xv-xvi) If the external environment has such a huge influence on our

everyday social behaviours, then it is imperative for us, collectively rather than individually, to grasp it. Navel-gazing in this case does not help.

An ethical consequence of narrowly focusing on our selves is the fundamental attribution error in human reason, 'When did this game of life become so unfair that we blame individuals rather than the circumstances that prevent them from achievement?… When other people screw up, it's because they are stupid or losers, but when I screw up it's because of my circumstances. The self illusion makes the fundamental attribution error an easy fallacy to accept. Also, putting all the blame on the individual self is tantamount to excusing all the policies that create inequality in our society.' (ibid: xvii).

Although Hood and probably many other social psychologists and philosophers can use the new scientific evidence to suggest or urge that people should rethink success and failure 'not so much as issues of the self alone, but more of society in general,' most of the people are recalcitrant to change in regard of their ego theories or pearl views on self. The cultural model of self's influence is too strong to overcome. As discussed in Section 2.3.2.1, the anthropologists have observed that out of custom and habit, people in the US, and perhaps in many other Western countries as well, generally believe passionately in individual success and independence. The flip side of this self model is that if people lose, they would not blame the society, or the cultural environment would not encourage them to.

Moreover, if the self is social and if our cognition and identities are largely shaped by our environment, as the scientists have indicated, then it may be precisely the social and environmental conditions that constrict our moral mind into individualistic an egoistic thinking. The status quo of our world today is that almost everyone has been incorporated and integrated in a globalised market economy as consumers, willingly or not. We all have to consume one way or another, from food and drugs to housing, healthcare and education (which were once provided publicly out of taxpayers' money in welfare states, but are not increasingly privatised under the aegis of neoliberalism), or we cease to be on this planet. This includes the QSers, naturally.

According to the British sociologists Yannis Gabriel and Tim Lang, 'Until recently, in affluent economies, first, legal provisions in what the consumer can expect from a commercial transaction and second, fear of media exposé have curbed the worst excesses. Today, however, the mechanisms for legislation to counteract global fraud and the systematic

long-term damage to the interests of consumers or the environment across national boundaries are vague or non-existent. Not only redress for individual victims, but collective measures to protect consumers internationally and the future are severely hampered. The new globalized economy constrains justice for consumers to the individual level, when often what is needed is action at the collective level.' (Gabriel, Lang 2006: 120) This reduction of consumer protection on a global scale, along with the advancement of economic globalisation, has to some extent forced the consumers to fall back onto the conventional ego theory of self. The QSers have every motive to take control and safeguard themselves and their loved ones, if the overall social protection is being inevitably shrunk and shredded. When the going gets tough, the spirit of self-reliance, though never really gone, comes back with a vengeance.

In addition, the sophistication of marketing practices and rhetoric, assisted by the development in consumer psychology, has also helped frame the consumers (that is, everyone of us) as atomic individuals, putting emphasis on consumers' self-responsibility and reinforcing the cultural model of self. 'More recently, marketing text-books have adopted the language of risk assessment, whereby every purchase can be assessed for the risk it carries. Risk assessment is being used by today's corporations, particularly in high-profile areas such as agrochemicals and nuclear industries, to counter consumer claims that they have been turned into unwitting victims. They claim that the every form of consumption carries a risk. It quickly follows that consumers ought to be prepared to carry some risk. Risk assessment for today's management serves the same function that many psychological models from the 1950s did: it allows the enterprise to decide what is good (or bad) for the consumer while at the same time blaming the victim whenever things go wrong.' (ibid: 121-122) 'Blame the victim' has become an implied and affiliated condition in the neoliberal frame of pro-consumer choice rhetoric, i.e. if the consumer chooses, then they would not be able to blame the seller or others for giving them faulty products or services, irrespective of whether the consumer has been well-informed, or whether other consumer rights have been respected. It all falls on their own shoulders to assess and accept the risk.

For example, "[t]he sugar still gets put into babies drinks and rots teeth, but a new 'sugar-free' drink is brought on to the market. In this way, a victim story has helped create a new niche product. It also places the responsibility on the consumer by making it his or her choice

whether to purchase the old product. Blame is now placed squarely on the victim. 'If you care about your children's teeth, why did you not purchase our sugar-free brand?'" (ibid: 118)

So our current social, political and economic environments are not conducive to promoting a scientifically informed view of 'the self is social.' Since the QSers, facing such conundrums as aforementioned, largely take an individualistic, empirical and local approach towards fitness and self-improvement (and hence their success), it is more sensible to turn to the cultural model of self, the model they have adopted, as a frame of reference in my research. The cognitive anthropologist D'Andrade (1995: 163-164) offered an elaborate account of the folk (cultural) model of the self when he was depicting the cultural model of the mind,

> 'The conscious, perceiving center of awareness and agency is the *self.* However, in the folk model the self is a composite entity; it is composed of both a conscious, aware *perceiver* and a thing that is perceived as doing the perceiving. William James called the *perceiver* the "I" and the entity perceived the "me." The *perceiving self* not only observes things in the world, it also perceives that it is perceiving — that is, it is *conscious.* The *perceiving self* has a continuing identity through time; it knows that it is the same *perceiving self* that it was aware of across previous observations — it observes that it is the same observer that was observing before…
>
> The other half of the self is the *perceived self*. The two halves are inseparable; there cannot be a perceived self with (sic) a perceiving self, and there cannot be a perceiving self that has nothing about itself to perceive.
>
> The perceived self in the folk model has an onion-like character with many layers which can be peeled away. That is, one can say "I want a cigarette"; here the the center of awareness and agency includes the desire. Or, one can say "I'm going crazy for a cigarette." Here the desire is treated as outside the self; acting on the self. "The thought struck me" and "I was overcome by my feelings" are other examples of phrases where the process of thinking and the process of feeling are treated as outside the self. However, intentions are *always* within the self — an intention *is* the self deciding to act.
>
> For most people, their body is an important part of their *perceived self*, but there are people who say that they feel that their actual body is not really their self — that they are really a woman, not a man, or really young, not the old person you see. Also the

perceiving self sometimes notices inconsistencies in what it thinks, likes, wants, feels, etc. These inconsistencies can lead to a sense of being "divided," "fragmented," etc., and sometimes thoughts and feelings are said to be experienced as "not really me" as if the *perceiving self* was experiencing someone else. However, the normal expectation is that one's body, one's past actions, one's perceptions, thoughts, feelings, desires, and intentions are part of oneself. The *real self*...is that part of the *perceived self* which is not divided or fragmented, but which is a natural and spontaneous source of thought, feeling, and desire.

The *perceived self* cannot only contract, it can expand. Certain things and certain people can become a part of the self in the sense that the things that happen to these things and people are experienced as happening to the *perceived self* — my child is hurt and I feel the hurt, my country is insulted and I feel insulted, my car is admired and I feel good. This expansion of the self is linguistically coded in the first person plural forms *we, us,* and *our* in which some aspect of identity is shared.[16]

The total self is thought to be able to control actions — most of what one does one intends to do, so one *could* have decided to do differently. However, although one is not able to control what one feels or desires, because one can control what one things, one can (sometimes) affect what one feel or wants by not thinking of the things that give rise to these feelings or wants. Thought is also important in creating the objects of desire; generally speaking one can only want what one can think of (however, sometimes one wants something without knowing what one wants).

It is interesting that the folk model acknowledges that many events can happen which are not predicted on the basis of the model. In hypnosis, one can be induced to "not see" what is in front of ones eye's (sic), and to "see things" that are not there. In depression, one has feelings of despair that have no rational source. However, such events do not challenge the truth of the model. Instead such events are defined as "abnormal"; the sort of thing that happens in "depression" or "addiction" or "compulsion" or "fever" or "hypnosis" or "mental breakdown." By defining what it

[16] My observation of the QS blogs suggested that this expansion of the perceived self is also linguistically coded in the first person singular possessive *my.* Whenever a QSer puts *my* before a thing, such as *my data*, *my heart rate*, *my account* and *my cat*, the perceived self expands to include that thing as a part of itself. Cleverly, a QS app maker branded their app as 'MyFitnessPal,' thus linguistically and cognitively blending the app with the QSers' identities, increasing its 'stickiness.'

fails to explain as abnormal, the folk model protects itself from falsification. The folk model may have a good deal of truth to it, but it is not science.' (original emphases)

2.3.2.2.1 Subject-self(-other) relations, distributed cognition, posthumanism

Similarly, though independent of the cognitive anthropologists' work, Lakoff and Johnson have proposed a Basic Subject-Self Metaphor Schema, which I have used to analyse the cultural model of QS. Lakoff and Johnson (1999: 267-289) said, 'What we call our "inner lives" concerns at least five kinds of experience that are consequences of living in a social world with the kinds of brains and bodies that we have. First, there are the ways in which we try to control our bodies and in which they "get out of control." Second, there are cases in which our conscious values conflict with the values implicit in our behavior. Third, there are disparities between what we know or believe about ourselves and what other people know or believe about us. Fourth, there are experiences of taking an external viewpoint, as when we imitate others or try to see the world as they do. And last, there are the forms of inner dialog and inner monitoring we engage in.'

'The general structure of our metaphoric system for our inner lives was first uncovered by Andrew Lakoff and Miles Becker (Lakoff and Becker 1992). Their analysis showed that the system is based on a fundamental distinction between what they called the Subject and one or more Selves. The Subject is the locus of consciousness, subjective experience, reason, will, and our "essence," everything that makes us who we uniquely are. There is at least one Self and possibly more. The Selves consist of everything else about us-our bodies, our social roles, our histories, and so on,' said Lakoff and Johnson.

'The ultimate philosophical significance of the study is that the very way that we normally conceptualize our inner lives is inconsistent with what we know scientifically about the nature of mind. In our system for conceptualizing our inner lives, there is always a Subject that is the locus of reason and that metaphorically has an existence independent of the body. As we have seen, this contradicts the fundamental findings of cognitive science,' they pointed out.

In regard to the structure of the metaphoric system they proposed for describing the folk model of self, Lakoff and Johnson said, 'Our metaphoric conceptions of inner life have a hierarchical structure. At the highest level, there is the general Subject-Self metaphor, which conceptualizes a person as bifurcated. The exact nature of this bifurcation is specified more

precisely one level down, where there are five specific instances of the metaphor. These five special cases of the basic Subject-Self metaphor are grounded in four types of everyday experience: (1) manipulating objects, (2) being located in space, (3) entering into social relations, and (4) empathic projection-conceptually projecting yourself onto someone else, as when a child imitates a parent. The fifth special case comes from the Folk Theory of Essences: Each person is seen as having an Essence that is part of the Subject. The person may have more than one Self, but only one of those Selves is compatible with that Essence. This is called the "real" or "true" Self.

Finally, each of these five special cases of the general Subject-Self metaphor has further special cases. It is at this third level of specificity that the real richness of our metaphoric conceptions of Subject and Self emerges.'

Specifically, the special-case conceptual metaphors Lakoff and Johnson (1999) have identified for their Basic Subject-Self Metaphor Schema include,

SELF CONTROL IS OBJECT CONTROL

SELF CONTROL IS OBJECT POSSESSION

SELF CONTROL IS BEING IN ONE'S NORMAL LOCATION

THE SELF AS CONTAINER

SELF CONTROL AS BEING ON THE GROUND

ATTENTIONAL SELF CONTROL IS HAVING THE SELF TOGETHER

VISION FROM THE INSIDE (OF SELF) IS SUBJECTIVE KNOWLEDGE

VISION FROM THE OUTSIDE (OF SELF) IS OBJECTIVE KNOWLEDGE

SUBJECT AND SELF AS ADVERSARIES

SUBJECT AS PARENT AND THE SELF AS CHILD

SUBJECT AND SELF AS FRIENDS

SUBJECT AND SELF AS INTERLOCUTORS

SUBJECT AS CARETAKE OF SELF

SUBJECT AS MASTER, SELF AS SERVANT

THE SUBJECT IS OBLIGATED TO MEET THE STANDARDS OF THE SELF

MULTIPLE SELVES

ADVISORY PROJECTION

EMPATHIC PROJECTION

THE INNER SELF

THE EXTERNAL REAL SELF (REAL ME)

THE TRUE SELF

In addition to the metaphors of self, I will review the literature of metaphors of big data in the next section of 2.3.3.

Responding to my examiners' insightful questions and advice, I also want to draw a distinction here between the subject and self based on a posthumanist view of distributed cognition, as well as illustrate the dynamic interplays between the two with some QS examples.

According to N Katherine Hayles, a literary critic and pioneering scholar on posthumanism studies, '"Thinking,"…refers to the thoughts and capabilities associated with higher consciousness such as rationality, the ability to formulate and manipulate abstract concepts, linguistic competencies, and so on. *Higher consciousness is not, of course, the whole or indeed even the main part of this story: enhancing and supporting it are the ways in which the embodied subject is embedded and immersed in environments that function as distributed cognitive systems*.' (2017: 2, emphasis mine)

'From a cluttered desktop whose complicated topography acts as an external memory device for its messiness-inclined owner, to the computer on which I am typing this, to the increasingly dense networks of "smart" technologies that are reconfiguring human lives in developed societies, *human subjects are no longer contained—or even defined—by the boundaries of their skins*.' (ibid, emphasis mine)

Hayles wrote, 'When my focus is on individual subjects, I will use the more processually marked term "nonconscious cognitive processes." The power of these assemblages, however, is maximized when they function as *systems*, with well-defined interfaces and communication circuits between sensors, actuators, processors, storage media, and distribution networks, and which include human, biological, technical, and material components. In these instances, I will refer to the cognitive nonconscious, a term that crucially includes technical as well as human cognizers.' (ibid, original emphasis)

Thus, in a posthumanism sense, the subject is an assemblage of 'nonconscious cognitive processes' which are embodied and embedded in techno-socio-cultural environments and function as distributed cognitive systems the support higher, rational consciousness.

Arguably, the cognisers', or cognitive systems', embodiments can be biological (such as human subjects), but also technical (such digital subjects as smart phones) and informational (such as avatars and data doubles). This conceptualisation is compatible with Floridi's proposal of inforgs in an infosphere, as discussed at the beginning of Chapter 1.

More importantly, for the human subjects, meaning and a sense of the self, which is a part of the human consciousness, emerge from the interactions and mutual shaping with the other cognitive subjects, i.e. from the self-other relations.

Like Wayne Booth (who compared fictions to the company we keep, as discussed in Section 1.2.1), Hayles also wrote about books, materially embodied as physical cognisers, and their shaping effects on human subjectivity, '[B]ooks are more than encoded voices; they are also physical artifacts whose material properties offer potent resources for creating meaning. Indeed, it is impossible not to create meaning through a work's materiality. Even when the interface is rendered as transparent as possible, this very *immediacy is itself an act of meaning-making that positions the reader in a specific material relationship with the imaginative world evoked by the text*.' (2002: 106-107, emphasis mine)

She further illustrated her point, extending from physical subjects to digital ones, with commentary on a digital artistic installation called ~~database~~, that 'subjectivity is an emergent property produced in part by the work's materiality. The interplay between semiotic components and physical attributes that gives rise to materiality simultaneously and with the same gesture gives rise to *subjects who both perceive and are acted upon by this materiality*.' (ibid: 107, emphasis mine)

Echoing Hayles, Italian posthumanist philosopher Francesca Ferrando wrote, 'In the economy of knowledge, *humans are both subjects and objects*: even when trying to avoid anthropocentric positions, humans are still communicating specific and situated human understandings in a human language to other human beings. Posthumanism shares with humanism the fact that it is still *enacted by human beings*, but accesses such *an epistemological standpoint through the feminist policies of situating the self, and also by acknowledging the self as plural and relational*. Posthumanism postulates a specific self-awareness, which *recognizes its own embodied location without placing it at the top of any epistemological hierarchy*.' (2019: 23, emphasis mine)

In the notes to the above exposition of the human subject-self-other relations, Ferrando cited Michel Foucault (1970 [1966]) as saying that '"[the human science] appeared when man constituted himself in Western culture as both that which must be conceived of and what is to be known" (345).' This is in line with the cognitive anthropologist's observation of the cultural model of the 'perceiving and perceived selves,' expressed through language use, as discussed in the previous section of 2.3.2.2.

Ferrando also cited Hannah Arendt, who 'in The Human Condition (1958), evocatively wrote: "It is highly unlikely that we, who can know, determine, and define the natural essences of all *things* surrounding us, which we are not, should ever be able to do the same for ourselves—this would be like jumping over our own shadows (10)." Consequently, we could define this self-awareness as a recognition of the unredeemable presence of the "shadows," to use Arendt's expression.' (emphasis mine) That is perhaps why the QSers, seeking self-knowledge through numbers, use external monitoring by the other cognisers (i.e. digital devices) in an effort to jump over their own 'shadows.' In other words, they voluntarily subject themselves to being perceived and acted upon, during which processes they objectify themselves (or certain versions of their selves) as things that can be known, determined and defined.[17]

In summary, for a human subject, meaning and awareness of the self — where there can be multiple versions of it, are enacted by the subject, and they emerge or arise from their interaction with the other (variously) embodied human and/or non-human subjects. As Hayles put it briefly, 'Generally speaking, the "subject" is understood to be the socially positioned embodied entity that includes unconscious, nonconscious and subconscious thoughts and beliefs, whereas the "self" is a narrower set of ideas that consciousness has about itself.'[18]

I want to make use again of my personal experience of self-tracked jogging in a park, used in Section 2.2, for an illustration here of how a distributed subjectivity can be formed and

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[17] It has been reported that companies using surveillance technologies, such as the US retailer Target, motivated by creating loyal customer base for profits, and the major Web 2.0 platforms such as Amazon, Google and Facebook, know better or more about you (i.e. your shopping, searching, sharing and other habits) than you do yourself. (Duhigg, 2012) Part of the reason is because the technical subjects 'remember' better than humans, with all the recorded details being stored forever in and easily retrievable from the data warehouses. We may even not be aware of many of those digital footprints, for their lack of cognitive saliency. Unlike human memory, which is emergent every time we try to recall, computer memory is stored and retrieved as physical states on hard drives, hence far more stable. Also, a statistical technique used by digital surveillance is exponentially increase sampling frequency, which may be invasive, in order to improve their respective prediction models. Hence the big data (at least, one of its etymologies).

[18] Personal communication after viva voce on 23 November 2020.

mutually shaped by the technologies I have adopted. (Hayles (2017: 2-3) gave a similar example of a mobile phone user.)

By wearing the sensors that monitor my body positions in three-dimensional space and record my heart rate and by connecting them to my running apps on my smartphone, I have enacted a human-technical assemblage of different levels of cognitive processes. From a user's, i.e. a human subject's, perspective, I could perceive and act upon the sensors through manipulating the graphic interfaces in my apps, clicking on respective icons and buttons, all of which were material metaphors,[19] mapping onto different levels of software codes and scripts, or different levels of abstraction (including those of the applications, middleware and underlying operating system) and pointing (or indexing) to their corresponding, preprogrammed hardware operations. During the manipulation of and interaction with the apps and sensors, the graphic displays (of my running time, distance, pace, etc) and machine-generated voice prompts (based on real-time analysis of my postures and performance levels) helped evoke an imagination, or a dynamic image metaphor, of my being in an outdoor running lab on a moving treadmill with a personal coach. It is a carefully designed metaphor that the equipment manufacturers worked out to signify to (or, in a naive sense, brainwash) me and other users through multi-media/modality. My cognitive system was thus extended by the digital prostheses beyond my skin into a third, blended space of both the park I was running in and the other places and experiences I had had. I was at the same time in the park and not in the park. Thus, the boundary of the park was actually transgressed, and the park itself was being appropriated and adapted into my assemblage.

Furthermore, as I have observed throughout the years of my PhD in the parks both near my campus and far away, many jogging hobbyists have practised self-tracking with, at least, a smartphone app, if without a variety of DIY accessories. They apparently have, I assume, enjoyed the liberating pleasure of transgressing and appropriating brought about by the new tech. Perhaps it was due to the increasing popularity of jogging in the parks, the municipal government has actually spent millions of the infrastructure budget in paving synthetic rubber tracks in several parks and along some riverside and lakeside trails. Hangzhou, our neighbouring capital city of Zhejiang Province and home to the Chinese platform

[19] The concept of material metaphor was first proposed by Hayles (2002: Chapter 2), and then further developed for media-specific metaphor analysis or 'reverse-engineering' by Van den Boomen (2014). However, because of the limitation of the scope of the current thesis, focusing on conceptual and systematic metaphors, I will not elaborate this method and will only apply it selectively.

conglomerate Alibaba, even advertised in newspapers in 2016 its completion of a major riverside rubber track system, extending 7.4 kilometres in total and touted as the longest in the country. (Anonymous 2016) It was a landscape metaphor and symbol that was constructed, both metaphorically and literally, to signify the city's health-oriented environment and vitality, a utopia aiming to attract teach-savvy young talents and evoking positive imaginations (there was a visualisation in the news signifying blossoms of 1,300 cherry trees along the riverside running track).

Therefore, on one hand, by tracing the metaphors, I have illustrated how a subjectivity, from a human subject's point of view, was brought into being across the overlapping conceptual, virtual and material networks, even extending beyond the individual into the socio-economic and eco-political environments.

On the other hand, if we can think in the digital subjects' shoes, so to speak, or in the app designer's shoes, we can probably also think about how the human subject is acted upon, shaped and socially positioned by the technologies. Since the sensors and computers did not speak in natural human tongues, I could not communicate with them verbally. Rather, I was messaging, or signifying, to them nonverbally, with my heart beats and body movements. Meanwhile, unlike previous generations of passive cognisers such as books, the programmed and networked apps and sensors could actively tend to and have a preconfigured 'intention to' listen to, capture, model and profile my nonverbal messages. So these material human-computer interfaces translate and transcode the biological into the digital, in a material metaphor sense (Van den Boomen 2014: 189). (Admittedly, the translation is a highly technical and complex process, involving data approximation and model estimations.) In parallel, within my body, the neural signals of my bodily states and functions, for instance, whether my heart needs to pump out more blood or how I should adjust my posture to keep balance, were also processed by my proto-self, or the cognitive nonconscious. So, in a way, the technical assemblage simulated, however imperfectly, a part of the function of my neural systems.

The concepts of proto-self and cognitive nonconscious need some elaboration here. According to Hayles (2017: 45-46), what the neuroscientist Antonio Damasio calls the proto-self is '"an interconnected and temporarily coherent collection of neural patterns which represent the state of the organism, moment by moment, at multiple levels of the brain"

(Damasio 2000, 174.) The proto-self, Damasio emphasizes, instantiates being but not consciousness or knowledge; it corresponds to what I have been calling the cognitive nonconscious. Its actions may properly be called cognitive in my sense because it has an "intention toward," namely the representation of body states. Moreover, it is embedded in highly complex systems that are both adaptive and recursive.' In addition, citing 'Edelman's Theory of Neuronal Group Selection (TNGS), which he calls "neural Darwinism" (Edelman 1987),' Hayles pointed that the proto-self also includes 'the neuronal mechanisms and dynamics that constitute a proto-self from the underlying neurons and neuronal clusters, as well as the processes by which scenes are built from maps through recursive interactions between an organism's representations of body states and representations of its relations with objects.'

These representations are grounds for higher-level simulation in our consciousness : if the information from the underlying neuronal clusters 'is contextually appropriate to the (conscious) executive control that determines the focus of attention,' then it will be feedforwarded into the conscious brain in a sustained manner of activation through a mechanism of combined bottom-up and top-down neural signalling, which Dehaene (2009), cited by Hayles (2017: 53), calls 'ignition of the global workspace.' The simulation of our experience in the outer world, important for our survival in it, although inaccurate, is our narrative self, according to the neuroscience model of self discussed in the previous section of 2.3.2.2.

So what are the relations between our own narrative-self simulation and the external numerical simulation by the quantified-self apps ? And how do the digital subjects, embedded and operating in the human-technical assemblage, shape and position the human subjects and their self-awareness ? As Hayles (2005) has pointed out, human life and cognition as well as many other organisms in our world are dynamic systems that are too complex to be reduced to linear mathematical equations — the 'irreducible complexity of contemporary posthuman configurations,' as she emphasised. Broadly speaking, 'as Nicholas Gessler, among others, has pointed out,' there were three ways the human cognisers have taken to understand the world around us, i.e. 'mathematical equations, simulation modeling, and discursive explanations. Of mathematical equations, I have little to say, other than to note the point that Harold Morowitz, Stephen Wolfram, and others make about the limited usefulness of

mathematics in describing complex behaviors. Because complex systems exhibit nonlinear behaviors that typically cannot be described by equations having explicit solutions.' (ibid: 5)
Of the other two modes of understanding, while similar in some aspects, Hayles has pointed out that there are also important differences between simulations and such discursive explanations as literary texts. 'Whereas computation is essential for simulations that model complex phenomena, literature's stock-in-trade is narrative…Narrative, with its evocation of the human lifeworld, speaks to subjectivities that remain rooted in human perceptual systems, human languages, and human cultures. Simulations, by contrast, are essentially numerical calculations. Although they can be rendered in visual forms that evoke the perceptible world that humans see…these appearances are generated through algorithms that operate first and foremost with numerical quantities…The dynamic tensions between simulation and narrative thus involve a dialectic between the human lifeworld and the (relatively) inhuman world of massive numerical calculations' (ibid: 6)
'This entanglement of the bodies of texts and digital subjects is one manifestation of what I call "intermediation,'' that is, complex transactions between bodies and texts as well as between different forms of media. Because making, storing, and transmitting imply technological functions, this mode of categorization insures that the different versions of the posthuman will be understood, in Kittlerian fashion, as effects of media.' (ibid: 7)
Following Hayles' categorisation, I propose that there are intermediations between the QSer and the apps and gadgets he has used, or between the narrative simulations he has in his mind and the numerical simulations he has in his apps. There are three layers of implications. First, both sorts of simulations are imprecise, but in different ways: the narrative-self simulation leaves out largely cognitively inconspicuous or contextually irrelevant information to the nonconscious, specialised neural processors, so that the conscious brain is not overwhelmed, whereas the quantified-self simulation uses simplified causalities, or correlation models

(throwing out many variables that cannot be captured[20] or that are impractical to calculate) to approximate such complex psychosomatic interactions as heart-rate, body posture and performance[21], and it then uses visualisation to accentuate this simulated (approximated, second-order) nonconscious cognitive information, i.e. to artificially increase its energy level, so that it can be perceived and conceived by (feedforwarded into) the consciousness, thus shaping the human subject's narrative self-awareness. In some cases, this purposefully accentuation of the partial cognitive nonconscious may complement the QSer's narrative self. For instance, my own self-tracking experiences have inculcated in me a habit of paying attention to my biometrics, more so than most of my non-self-tracking or non-gym-going peers. As I have kept practising and experimenting with various sorts of self-tracking in many different scenarios, the QS apps have helped sustain the activation of the awareness of my changing and fluctuating vital signs (which are parts of my self). So when my health derailed from the 'normal' course, I was aware of and could recognise the signposts that could lead me back on track, so to speak. (Although this was an unintended consequence, given that when I started self-tracking, I was healthy and sound.)

For the other QSers, whose blogs I have collected into my corpus analysis, I have identified that they are also more likely to pay attention to, or more interested in, their biometrics (i.e. this information has become more cognitively salient to them) in their everyday life, not necessarily for health purposes. In one of the more prototypical blogs I have analysed,[22] titled Visualizing HR, HRV, and GSR While Watching 'Interstellar' (file name 056_28_1), the

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[20] Such as interior feelings, or qualia. 'Feeling states first arise from the operation of a few brain-stem nuclei that are highly interconnected among themselves and that are the recipients of highly complex, integrated signals transmitted from the organism's interior. In the process of using body signals to regulate life, the activity of the nuclei transforms those body signals. The transformation is further enhanced by the fact that the signals occur in a looped circuit whereby the body communicates to the central nervous system and the latter responds to the body's messages. The signals are not separable from the organism states where they originate. The ensemble constitutes a dynamic, bonded unit. I hypothesize that this unit enacts a functional fusion of body states and perceptual states, such that the dividing line between the two can no longer be drawn. Neurons in charge of conveying to the brain signals about the body's interior would have such an intimate association with interior structures that the signals conveyed would not be merely about the state of the flesh but literally extensions of the flesh. Neurons would imitate life so thoroughly that they would become one with it.' (Damasio 2010)

[21] Despite of Hayles' (2005: 7) urge to never reduce the 'irreducible complexity of contemporary posthuman configurations' 'to linear dynamics or simple causalities,' linearisation, or linear programming, is still an important class of technique that has been commonly used not only in computer simulations but also in 'guiding quantitative decisions in business planning, in industrial engineering, and—to a lesser extent—in the social and physical sciences.' (Gregersen, 2020) It is used conveniently under multiple constraints to approximate a nonlinear problem and find local optimal solutions.

[22] C.f. technical discussion of prototypicality identification in Section 4.3, particularly 4.3.2.

QSer took their wearable equipments with them to an IMAX theatre and recorded the biometrics during a three-hour movie watching. They recorded more granular data than I did, not just heart-rate, but also heart-rate variability (HRV) and galvanic skin response (GSR), the kinds of data one would get when going to a hospital and do an electrocardiography (ECG).[23]

In yet another more prototypical blog entry, Quantified Splunk: Tracking My Vital Signs (file name 012_05_2), another self-tracking enthusiast also purchased medical-grade equipments, blogging, 'Recently – as my friends and colleagues will tell you – I've taken this concept of self-tracking to the next level. This has included purchasing both a blood sugar and a blood pressure monitor.' But it was not immediately obvious that they were monitoring their blood for any disease, such as diabetes, since they were trying to figure out 'what does this mean ?' by comparing their personal data with the '"normal"' reference ranges from the website of Mayo Clinic but also correlating with the data from 'other life logging devices' using the tools on data aggregating platform Splunk, where they also worked as an employee. Tellingly, when the QSer tried to show-and-tell the blog readers how they did a visualisation of their pulse and blood pressure data over time with Splunk, they used a novel metaphor as section heading, 'Step 5: Start searching yourself.' This conceptual metaphor is particularly interesting, because it is arguably an outlier or atypical case in Lakoff and Johnson's CMT. The source domain is data and the target domain is self. SELF IS DATA. Both domains are abstract generally speaking, or, at least, for non-QSers. However, for a QSer who regularly manipulated data through graphic interfaces, data has become more concrete and tangible than self. Data is searchable (thanks to a searchable database infrastructure behind the interface and screen, of course), so the self is searchable, too. Perhaps it is more of a blended metaphor (Fauconnier, Turner 2002), where the input space of data and that of self were mixed into a blended space of disembodied, quantified and searchable narrative-self. There is also another Haylesian factor to be considered here that has probably given rise to, or activated, this novel metaphor in the QSer's mind. The computer-generated graph is a classical (interface) material metaphor (Hayles 2002: 22), and in the self-tracker's case, the

[23] When I went to check out the app the Interstellar watcher used, SweetBeat HRV (https://www.sweetwaterhrv.com/SweetBeatHRV.shtml), the manufacturer stated on the product's webpage that it was an '*EKG-like* heart beat trace.' That is, a metaphor. Unlike a medical EKG or ECG, in this consumer-grade app's feature description, it did not specify what monitoring accuracy it had under what testing conditions. Common sense tells us that even for high-accuracy medical equipments, if we took them outside the lab, the test results will not be medically reliable. But it's perhaps another story for lifestyle self-trackers.

graphs mapped or corresponded proportionally to their vital signs, without a glitch. This smooth proportion-preserving translation, as Van den Boomen (2014: 67, 192) has elaborated, of biological phenomenon onto a digital inscription device gave the self-tracker an impression that the data doubles were authentic copies of their self, like in photography where both analogue and digital pictures could be rendered to represent and index the photographed person.[24] In other words, through data visualisation the digital cognisers have spun an apparently authentic story of what happened to/in/about the human subject and fed it to the human in order to co-construct and influence their narrative-self.

The second implication of the intermediations between the digital and human subjects is that the human's interest is activated in quantifying an ever increasing number of aspects of their daily life and environments beyond biometrics. Two QSers I have analysed tracked their pets, human's best friends, and I can only speculate that we may one day read in the news or blogs about self-tracking geeks quantifying their girl/boyfriends, colleagues, students and supervisors. This could naturally happen, because the self is inherently relational. In order to know ourselves, especially for gaining more control of ourselves, we would want to know the other humans and non-human animals alike that are embedded in our same material environment as well as to know the environment itself, critical for our survival. (E.g. measuring daily particulate matter density in the air, especially PM 2.5, as an indictor of air pollution levels, has become a great health-environmental-political issue and big business in China since 2012.[25])

Although not studying the QSers specifically, Lakoff and Johnson (1980) also mentioned briefly about the Western culture of quantification. 'LABOR IS A RESOURCE and TIME IS A RESOURCE are by no means universal. They emerged naturally in our culture because of the

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[24] 'In Peirce's terminology photography is both iconic (based on analogy and similarity with the object represented) and indexical (based on a physical, causal relation with the object). This combination seems to secure an equivalence and verisimilitude between what 'has been there' and what is represented, based as it is on the causal physicality of a technological apparatus that is able to capture physical traces of light reflected from an object and translate these to analog inscriptions on an artifact. The apparent objective causality of photographic technology yielded to an all too easy equation between indexicality and truth for photography and documentary film…indexicality is far from dissolved by digitality. I would even argue that digital indexicality has become predominant in any digital praxis, ranging from forensics to governance to daily computing. The ubiquitousness of databases, IDs, passwords and login names estab- lished a regime of indexicality, driven by the logic of assigning privileges and legitimate positions to indexable, addressable subjects as users, customers, and citizens.' (Van den Boomen, 2014: 56-57)

[25] It was reportedly started by the American Embassy in Beijing tweeting their own daily PM 2.5 numbers on Chinese social media Weibo. They claimed it was for their own embassy staff's information, but it quickly gained traction in public discourse due to heavy air pollution, raising the public's health awareness and concerns.

way we view work, *our passion for quantification*, and our obsession with purposeful ends.' (ibid: 68, emphasis mine)

As I was fascinated by and retraced this mentality of quantification in Western history, I have found that what the late American environmental historian Alfred W Crosby (1997) called 'the new [cognitive] model' of quantification, which emerged around the 14th century, could serve as a precursor to today's QS culture. I excerpt a few relevant paragraphs below, footnotes omitted (ibid: Chapter 11).

'Beginning in the miraculous decades around the turn of the fourteenth century (decades unmatched in their radical changes in perception until the era of Einstein and Picasso) and continuing on for generations…sometimes in one terrain of *mentalité* and sometimes another, Western Europeans evolved a new way, more purely visual and quantitative than the old, of perceiving time, space, and material environment.

Vision was and is a martinet and an aggressor, encroaching on the realms of the other senses. Record events in chronological order on parchment or paper and you have a time machine. You can step back and observe beginnings and endings simultaneously. You can alter time's direction, and you can halt time so as to examine individual events. If you are an accountant, you can proceed backward to find a mistake; you can construct a balance sheet like a still photograph of the whistling storm of transactions.

…

In practical terms, the new approach was simply this: reduce what you are trying to think about to the minimum required by its definition; visualize it on paper, or at least in your mind, be it the fluctuation of wool prices at the Champagne fairs or the course of Mars through the heavens, and divide it, either in fact or in imagination, into equal quanta. Then you can measure it, that is, count the quanta.

Then you possess a quantitative representation of your subject that is, however simplified, even in its errors and omissions, precise. You can think about it rigorously. You can manipulate it and experiment with it, as we do today with computer models. It possesses a sort of independence from you. It can do for you what verbal representation rarely does: contradict your fondest wishes and elbow you on to more efficacious speculation. It was quantification, not aesthetics, not logic per se, that parried Kepler's every effort to thrust the

solar system into a cage of his beloved Platonic solids and goaded him on until he grudgingly devised his planetary laws.

Visualization and quantification: together they snap the padlock reality is fettered (at least tightly enough and for long enough to get some work out of it and possibly a law of nature or two).

…

The West's lead overall was not nearly as great as in the nineteenth century (when the gap became, so to speak, a matter of the steamboat versus the junk and dhow), and in some areas the West still lagged behind. For example, the Ottoman armies were better organized and trained and demonstrably superior to the West's: in 1529 the Turks were at the gates of Vienna. For another example, the Chinese version of the heavens, with no crystal spheres but celestial bodies floating in space, was closer to the truth than the West's. But Westerners' lead in the way they *perceived* reality and could, thereby, reason about and then manipulate it was enormous. They were cultivating what Eviatar Zerubavel calls the rationalistic character of modern culture: "precise, punctual, calculable, standard, bureaucratic, rigid, invariant, finely coordinated, and routine." All, we might add, pertain to or at least smack of the visual and quantitative.' (original emphases)

For a smack of the discourses of the QSers who were activated and motivated by their digital subjects to track their quantified cat and dog, respectively, I present some excerpts from the corresponding blogs 050_23_3 and 033_17_1 from my corpus below.

'Fitbit Fitness Tracker on a Cat — Java's Story

October 29, 2014

I planned on writing a blog post about attaching my old Fitbit One to my cat, Java, but it took me so long to write it that Java has now been walking around wearing his Fitbit for more than a year. So instead I'll cover some of the background around attaching the Fitbit One to my cat, as well as having a look at some of the data and trends I have uncovered from Java's 12 months of fitness tracking.

Quantified Cat: Background

Having originally purchased a Fitbit One and loving it, when the Fitbit Flex came out I decided to upgrade to that and retire my Fitbit One. A lot of my friends were still satisfied with their Ones, and I felt kind of guilty just chucking my old Fitbit One into the cupboard —

so I figured: why not duct tape it to the cat instead? It would probably be pretty interesting to know how many steps Java does, especially during the day when no one is around the house. I had some big, important, very serious questions in my mind: Does he walk around when humans aren't around? What are his most active hours? How much does he adventure during the middle of the night, when cats are supposedly at their peak? All of this and more could surely be answered by trusty, and available, old Fitbit One.' (File 050_23_3)

'Building a Sleep Tracker for Your Dog Using Tessel and Twilio

September 16, 2014

Have you ever wondered how long your dog sleeps while you're away at work? I have. As a hacker this seemed like the perfect excuse to strap a microcontroller to my dog, Gif, and see if I could find out. To make it a little more fun I thought I could have it text me when Gif wakes up to let me know how long he slept for. In this post I'll show how to build your very own sleep tracker for your dog using Tessel and Twilio.' (File 033_17_1)

In the case of 'Quantified Cat' Java, its owner probably named it after JavaScript, which is an 'object-oriented computer programming language commonly used to create interactive effects within web browsers,' according to the online version of Oxford Dictionary of English.[26] Moreover, the owner not only wanted to map the computer domain conceptually onto the cat by naming it, but also went on to physically map, i.e. attach/latch, a used Fitbit tracker onto the cat. The owner obviously personified the digital subject positively (or perhaps playfully) by feeling 'kind of guilty just chucking my old Fitbit One' and later calling it 'trusty, and available, old Fitbit One.' So they attached the tracker onto the cat out of affection or guilt for the digital one. It was much more than a conceptual metaphor, and could be an emotional metaphor as well. With regard to the Quantified Dog Gif, I believe the name also derived from the fashionable computer source domain of GIF (Graphic Interchange Format). Most of the animated emoticon images, or memes, that are popular on nowadays' social media are in this format.

Besides, for both of the owners of the Java and Gif, they were also motivated by their desires to dig into the cognitive nonconscious information in their assemblage, i.e. the behaviours of their pets when they were asleep or away from home. Arguably, these desires were activated

[26] https://www.lexico.com/definition/javascript

and fuelled by the imagined promises of their automated, available and trusty digital friends to visualise the invisible.

The third implication of the intermediations between the QS digital and human subjects is that the latter may become objectified, because the former has evolved the capabilities to actively categorise and classify the humans on a large scale. In perceptual psychology's terms, any object can have several affordances. So when a human animal becomes a quantifiable and classifiable object for a digital cogniser such as an app, they also come to have several affordances in the app's (ubiquitous) eye, so to speak. For a human, one of the salient affordances of an app is that it is clickable[27]. Conversely, for an app, one of the salient affordances of a human is that it is activate-to-click-able, i.e. they can be activated or motivated to click on user interfaces. Perhaps like a lexicon, a human-click is also polysemous for an app, but in a slightly different way. A click can take place in different places, or enacted on the digital symbols and icons in different contexts (such as a hyperlink on a webpage and a like button within an app) on a user interface, so the same clicking action (one-click, double-click, left-click, right-click, touch-click, mouse-click, etc) will lead to different digital objects, operations and destinations in the cyberspace. However, unlike a semantic polysemy, whose meanings can be created by a human subject interacting with another human subject for ad hoc or one-off situations, i.e. emerging intersubjectively, a click polysemy always consists of preprogrammed mappings between networks. Admittedly, the mappings can be changed, but they are for most of the time meticulously designed to stay relatively stable and rigid, so that after updating my operating system, for instance, I can still reliably find my files through the same steps of clicking (or I would be rather surprised or upset).[28] Therefore, the clicking polysemy for a digital subject, though many, is still finite, while the semantic polysemy for human (inter)subjectivity is, in theory, infinite (think of poetry and fiction as well as everyday conversations. Anything can be used by humans to

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[27] Clickability is also a typical computer material metaphor discussed by Van den Boomen (2014) in several places. 'User interfaces are built around various metaphors of one-click immediacy: icons, menu options, hyperlinks, like buttons, share buttons. Though these clickable or tappable interface metaphors certainly contribute to user-friendliness and wider adoption of digital devices, they also withhold user control and knowledge about the system. They are sign-tool-objects that hide their tool-being. Their clickability is based on indexical connections to the machinery of hardware, software, and protocols, but this indexicality is superseded by icontology: the seductive iconicity of metaphorical objects that ontologize iconic representations into taken-for-granted icon-objects.' (ibid: 190)

[28] Hayles (2002) offered some interesting artistic and experimental projects as counter-examples, i.e. user interface designs that intentionally violated a common user's expectations, or taken-for-granted habits of interacting with digital subjects.

signify anything else, hence every thing and word having potentials to be activated and become metaphorical, in the sense of cross-domain mappings.)

So in this train of thought, intermediating with the digital subjects can entail that the humans may lose some of their flexibility and creativity, but also gain some certainty and veracity. If a QSer's objective was to create digital versions of their authentic selves, as discussed in Section 1.2.2, or to increase efficiency in communication and work, then this kind of subjectivity-shaping could be helpful for them to create truthful self-images. If their purpose was to create fictional self-narratives, or to be creative and experimental, then this might not be beneficial or fit for the purpose.

Another kind of significant human affordance emerging from this type of intermediation is that the humans become position-able or segment-able for the apps, or more precisely, for the parties who design, manufacture and deploy the apps as agents for collecting consumer market intelligence. Through continuously enticing the human subjects to click in different places and settings and through aggregating and analysing these various human clicking behaviours with correlated data, an app, or, more likely, a platform running many sorts of these apps, can easily classify a human user, positioning them in one or several social categories. Afterwards, logically, the human's categorial features can be automatically capitalised upon, for instance, to push targeted advertisements to them.

But perhaps the most transparent positioning metaphor here is software customers are drug users. It may be an urban myth, but there has been for some time a poignant quote widely attributed to Edward Tufte,[29] a visualisation expert and professor emeritus of computer science, political science and statistics at Yale University, i.e. "There are only two industries that call their customers 'users': illegal drugs and software." Although indeterminable, a software or app customer may be potentially compared to a drug user or addict.[30] Etymologically, the sense of '[a] person who takes illegal drugs on a regular or habitual basis; an addict' (first entry in OED: 1923) appeared much later than the sense '[a] person who has

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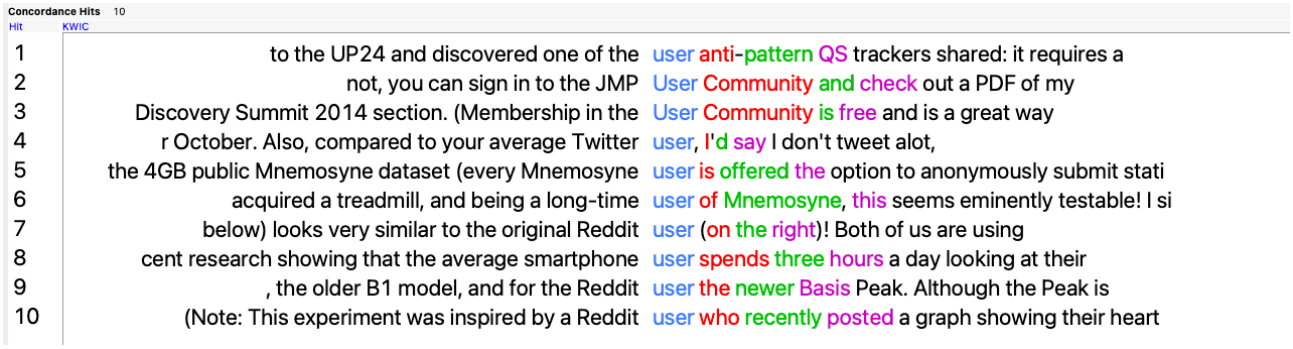
[29] For instance, in a recent review of Netflix's 2020 documentary The Social Dilemma, which criticised the social network platforms' business models of monetising on clicks, the quote was still attributed to Professor Tufte. (https://sundial.csun.edu/161195/arts-entertainment/review-netflixs-the-social-dilemma-is-a-great-conversation-starter-but-not-enough-to-create-change/)

[30] Natasha Dow Schüll, a cultural anthropologist at New York University, explored the relations between technology design and the experience of addiction in her book Addiction by Design: Machine Gambling in Las Vegas (Princeton University Press, 2012). She also studied the QS. During a personal communication with her at a QS conference in Amsterdam in 2017, she concurred that some apps were designed to be addictive.

or makes use of a thing, esp. regularly; a person who employs or practices something' (first entry in OED: c1425), according to the Oxford English Dictionary (OED). However, a search in the Corpus of Contemporary American English showed that currently, *drug user* has the highest collocation frequency (1784), higher than *internet user* (1026), *facebook user* (502), *twitter user* (425), *app user* (118) and *software user* (60), for examples. So *drug user* has the potential to be construed as a basic discourse meaning in the metaphorical use of the term.

It is noticeable that app customers or clients are now almost universally positioned as users. It is not only the people in the app industry address their customers thus, the customers themselves are also 'brainwashed' and voluntarily or unconsciously take up the 'user' identity tag. In my QS blog corpus, I have identified the following KWIC concordances for *user*, using AntConc. (Figure 1) All of the bloggers identified themselves as app, software or Web services users.



Concordance Hits 10

Hit	KWIC	
1	to the UP24 and discovered one of the	user anti-pattern QS trackers shared: it requires a
2	not, you can sign in to the JMP	User Community and check out a PDF of my
3	Discovery Summit 2014 section. (Membership in the	User Community is free and is a great way
4	r October. Also, compared to your average Twitter	user, I'd say I don't tweet alot,
5	the 4GB public Mnemosyne dataset (every Mnemosyne	user is offered the option to anonymously submit stati
6	acquired a treadmill, and being a long-time	user of Mnemosyne, this seems eminently testable! I si
7	below) looks very similar to the original Reddit	user (on the right)! Both of us are using
8	cent research showing that the average smartphone	user spends three hours a day looking at their
9	, the older B1 model, and for the Reddit	user the newer Basis Peak. Although the Peak is
10	(Note: This experiment was inspired by a Reddit	user who recently posted a graph showing their heart

Figure 1. KWIC concordances of user in QS blog corpus

In concordances 4 and 8, for instances, the full co-texts of the respective clauses revealed that the QS bloggers were aware of and concerned about their own or others' spending too much time on social media and smartphone apps, being addicted like drug users. One of the blogs were explicitly titled 'Where My 90 Hours of Mobile Phone Screen Time In September Went.' Here is the full co-text of concordance 4, 'Also, compared to your average Twitter user, I'd say I don't tweet alot [sic], generally only once every two days or so on average.' And here of concordance 8, 'When I first read the Yahoo Tech article that quoted some recent research showing that the average smartphone user spends three hours a day looking at their mobile screen, I thought "no way am I spending that much time using my Samsung Note 3."'

In sum, the human subject, the QSers in my studied case, with a dynamic cognitive system that is embodied and largely nonconscious, has recruited such digital subjects as self-tracking

sensors, apps and smartphones to co-construct a cognitive ensemble, known as a human-technical assemblage, which, by making use of conceptual and material metaphors and cross-domain, cross-network mappings, extend the human cognition beyond the skin. Hayles, citing Hutchins, has pointed out in How We Became Posthuman (1999) that '[m]odern humans are capable of more sophisticated cognition than cavemen…because they have constructed smarter environments in which to work.' In other words, 'material and informational scaffolding becomes part of that in which and out of which rhetorical and cognitive activity occur' (Rickert 2013: 70). During the interaction and intermediation between the human and digital subjects, the former manipulates the latter to gain self-knowledge through numbers, while the latter simulates the former's nonconscious cognition and feedforwards visualised, energised quantitative information into the formers' consciousness for helping them spinning a self-narrative, surreptitiously positioning the human subject into social categories that can be monetised.

2.3.3 Metaphors of big data

Drawing inspiration from Lakoff and Johnson (1980), technology critic Sara M Watson (online) has offered an elaborate overview of big data metaphors. 'Metaphors are helpful for understanding abstract concepts that, because of their complexity or scale, lie beyond our human comprehension. In their seminal work Metaphors We Live By, Lakoff and Johnson describe the conceptual metaphors that help with "referring, quantifying, identifying, setting goals, and motivating actions" for an abstract concept such as inflation. Given its ephemerality and abstraction, data is ripe for metaphoric description.'

'Metaphors prime us to take for granted the ways we think about things. Most of the metaphors we use to talk about data in popular culture make sense to technocratic corporations and their leaders, those building and disseminating information technologies, but they are fundamentally dehumanizing… The dominant industrial metaphors for data do not privilege the position of the individual. Instead, they take power away from the person to which the data refers and give it to those who have the tools to analyze and interpret data. Data then becomes obscured, specialized, and distanced.' (Watson, ibid)

The dominant metaphors today for understanding data are industrial, Watson said. (ibid) 'They start from Gartner and O'Reilly Conferences, make their way into the business section of *The New York Times*, and seep further into the style section as we parse our evolving

relationship to technology. Journalism itself has become data-driven in the likes of explainers like *Vox* and *FiveThirtyEight*.'

'Many of the metaphors we have for personal data today come from the big data industry.' As Tim Hwang and Karen Levy (2015) have suggested, these metaphors describe data as a "natural, inexhaustible good—ripe for exploitation in the name of economic growth and private gain." Also citing Lakoff and Johnson's work, Cornelius Puschmann and Jean Burgess (2014: 1698-1700) collect data metaphors into two categories:

BIG DATA IS A FORCE OF NATURE TO BE CONTROLLED

BIG DATA IS NOURISHMENT/FUEL TO BE CONSUMED

Puschmann and Burgess (ibid) argued, 'The complexity of big data lies in the increased abstractness of the means by which it is created and used. In contrast to commonly accepted rhetorically constructed knowledge ("givenness" in the early sense of data) or the outcome of collection and interrogation by a scientist (in the modern sense of the word), big data grows seemingly by itself in environments designed specifically for its cultivation. Its individual units are indistinguishable and form a mass of information in which exploitation is scalable. Rather than being recorded and analyzed by human analysts in relatively clearly bounded settings, big data exists ephemerally in the cloud.'

Puschmann and Burgess (ibid: 1701) argued that the meaning of *data* and *big data* are contested and evolving.

> 'In some of the accounts provided, data accurately reflects nature, society, and culture; the units in which it is packaged are comparable; and similar results can be produced under similar circumstances. The path of interpretation between the data and its meaning is short, and conclusions are independent of a particular context of the subjective views of the analyst. Through the use of a highly specific set of terms, the role of data as a valued commodity is effectively inscribed (e.g., "the new oil"; Rotella, 2012), most often by suggesting physicality, immutability, context independence, and intrinsic worth.
>
> We agree with van Dijk's contention that "metaphors are crucial narrative tools in the popularisation of knowledge; they provide prototypes for imaginary creations" (1998, p. 22). Because of the degree of abstractness of science and technology, conceptual metaphor is particularly salient in these domains. Science is often

> associated with metaphors of discovery and adventure, with "findings" being "uncovered" rather than explanations for natural phenomena articulated by researchers in the rhetorical fashion Rosenberg (2013) ascribed to early natural philosophy. Scientific facts are, like data, regularly framed as givens that are valid outside of a particular context rather than simply being pieces of discourse that are ascribed to specific actors and embedded in a specific context (Latour & Woolgar, 1979).' (ibid)

Meanwhile, Lupton (2013c) identified that the most commonly employed metaphors to discuss big data are those related to water or liquidity: streams, flows, leaks, rivers, oceans, seas, waves and so on. "Both academic and popular cultural descriptions of big data have frequently referred to the 'fire hose' of data issuing from a social media site such as Twitter and the data 'deluge', 'flood' or 'tsunami' that as internet users we both contribute to and which threaten to 'swamp' or 'drown us'. These rather vivid descriptions of data as a fluid, uncontrollable entity possessing great physical power emphasise the sheer volume and fast nature of digital data movements, as well as their unpredictability and the difficulty of control and containment. They suggest an economy of digital data and surveillance in which data are collected constantly and move from site to site in ways that cannot easily themselves be monitored, measured or regulated."

In addition, "data are also often referred as living things, as having a kind of vitality in their ability to move from site to site and morph into different forms. The rhizome metaphor is sometimes employed to describe how digital data flow from place to place, or from node to node, suggesting that they are part of a living organism such as a plant. This also suggests a high level of complexity and a network of interconnected tubes and nodes." The byproduct data that are generated are often compared to data 'trails', 'breadcrumbs', 'exhausts', 'smoke signals' and 'shadows.'(ibid)

Watson (online) commented that DATA AS A BYPRODUCT metaphors describe the transactional traces of digital interactions but suggest it is also wasteful, pollutive, and may not be meaningful without processing. Meanwhile, DATA AS A NATURAL RESOURCE suggests that it has great value to be mined and refined but that it must be handled by experts and large-scale industrial processes. Data has also been described as a fungible resource, as an asset class,

suggesting that it can be traded, stored, and protected in a data vault. These conceptual metaphors have been identified also in my QS blogs discourse, reflecting their popularity. Watson (ibid) further offered her own list of conceptual metaphors for big data:

> DATA IS A NATURAL RESOURCE: oil, gold rush, ecosystem, gathered, raw, trove
>
> DATA IS AN INDUSTRIAL PRODUCT: mining, refining, platform, breach, big data :: big pharma, big business
>
> DATA IS A BYPRODUCT: exhaust, data trail, breadcrumbs, smog, janitor, cleanser, smoke, signals, signal and noise
>
> DATA IS A MARKET: economy, paying with data, currency, asset, vault, broker
>
> DATA IS LIQUID: ocean, deluge, tsunami, torrent, wave, firehose, lake
>
> DATA AS TRENDY: data is the new oil, data is the new currency, data is the new black, data is the new bacon, data scientist is the sexiest job of the 21st century, frontier, revolution, wild west

Particularly, Watson (ibid) discussed the relations between the QS and embodied metaphor. She argued the 'most effective metaphors—ones so fundamental that we forget they are metaphors—draw on embodied experience, or "embodied cognition," fundamentally part of the way we think and act in the world.' Most of the industrial metaphors for big data are disembodied, thus lacking a personal and emotional connection, she said. In comparison,

> 'The metaphors used in the Quantified Self community offer a more personal, autobiographical, embodied, or practice-oriented conceptual model of data. Studying the early adopters of self-tracking technology, I've identified a set of emerging data metaphors starting from a personal, rather than industrial perspective. Some are still mechanistic, drawing on Taylorist theories about "managing what you measure." But others are more sympathetic and focus on embodied experience and personal reflection.
>
> DATA IS A MIRROR portrays data as something to reflect on and as a technology for seeing ourselves as others see us. But, like mirrors, data can be distorted, and can drive dysmorphic thought.
>
> DATA IS A PRACTICE references the self-tracking process that has been criticized as navel-gazing, but which can also be a means of introspection and a practice toward self-knowledge.' (ibid).

Although I have not found yet the two types of conceptual metaphors in my QS blogs as Watson mentioned, I agree that there is potential for embodied metaphor, or DATA IS A BODY, in the QS discourse to develop, since the QSers have already used many biometric concepts, such as blood pressure and heart rate.

2.4 Cognitive mapping and utopia

Since the digital technologies are born from abstract, mathematical ideas, people need to map their properties and uses onto a more concrete time-space in order to make sense of them, making use of a large number of familiar spatial metaphors. For example, the Web, the Net, site (or website) and cyber-space are all conventional spatial metaphors in CMC. More creative spatial metaphors include comparing such Internet services as amazon.com and tmall.com to online shopping malls. In reality, these Internet conglomerates operate like bureaucracies rather than supermarkets. In their offices and headquarters, they do not have shelves of groceries and necessities to sell and there are no customers, either. Instead, there are aisles of desks for employees working on computers and laptops and stacks of mainframe machines and hard discs in their enormous data warehouses.

This cognitive process of putting abstract and unfamiliar things into more concrete and familiar ideas using spatial metaphors is known as cognitive mapping. It helps an individual subject situates and reorients themselves within a vast, unrepresentable totality, a process that corresponds to the workings of ideology. Thus, cognitive mapping does not have to be accurate representation, and in fact it is often distorting the reality.

To elaborate this ideological process of cognitive mapping and its relation to QS movement as utopianism, I first draw on Jameson (1991: 51-52), who compared it to a physical process of locating oneself geographically,

> ‘[T]he conception of space that has been developed here suggests that a model of political culture appropriate to our own situation will necessarily have to raise spatial issues as its fundamental organising concern. I will therefore provisionally define the aesthetic of this new (and hypothetical) cultural form as an aesthetic of cognitive *mapping.*
>
> In a classic work, *The Image of the City*, Kevin Lynch taught us that the alienated city is above all a space in which people are unable to map (in their minds) either their own positions or the urban totality in which they find themselves: grids such as

> those of Jersey City, in which none of the traditional markers (monuments, nodes, natural boundaries, built perspectives) obtain, are the most obvious examples. Disalienation in the traditional city, then, involves the practical reconquest of a sense of place and the construction or reconstruction of an articulated ensemble which can be retained in memory and which the individual subject can map and remap along the moments of mobile, alternative trajectories. Lynch's own work is limited by the deliberate restriction of his topic to the problems of city form as such; yet it becomes extraordinarily suggestive when projected outward onto some of the larger national and global spaces we have touched on here.
>
> There is, for one thing, a most interesting convergence between the empirical problems studied by Lynch in terms of city space and the great Althusserian (and Lacanian) redefinition of ideology as "the representation of the subject's Imaginary relationship to his or her Real conditions of existence." Surely this is exactly what the cognitive map is called upon to do in the narrower framework of daily life in the physical city: to enable a situational representation on the part of the individual subject to that vaster and properly unrepresentable totality which is the ensemble of society's structures as a whole.

Therefore, the practices of self-tracking can also be considered as cognitive mapping, i.e. the people use QS gadgets and tools to draw a situational representation of, or map out, the vast, abstract, changing and ephemeral space of big data in their everyday life, so that they know by numbers on a daily basis where they are, how they are doing and how they should proceed to reach certain goals and destinations in the hyper complex infosphere. In this sphere, as mentioned earlier in Section 1.1.2.2, not only humans are decentred, but also they need to learn how to deal with the other emerging informational agents, which may not have physical embodiments in the offline world. The blurring of the boundaries between online and offline means that people, who by convention are more familiar with the offline reality, have to find a way to map the online spaces and the entities therein onto their embodied experiences offline.

2.4.1 Types and functions of utopias/dystopias

The QS movement has also been associated with a form of technological utopianism, known as the Californian Ideology. According to Barbrook and Cameron (2001: 364),

> it refers to a new millennium faith that 'has emerged from a bizarre fusion of the cultural bohemianism of San Francisco with the high-tech industries of Silicon Valley. Promoted in magazines, books, TV programs, Web sites, newsgroups, and Net conferences, the Californian ideology promiscuously combines the free-wheeling spirit of the hippies and the entrepreneurial zeal of the yuppies. This amalgamation of opposites has been achieved through a profound faith in the emancipatory potential of the new information technologies. In the digital utopia, everybody will be both hip and rich.'

This is arguably a good life worth aspiring to, and if realised, it would be a great personal success. Success and fitness are what the QSers aim at.

> 'Not surprisingly, this optimistic vision of the future has been enthusiastically embraced by computer nerds, slacker students, innovative capitalists, social activists, trendy academics, futurist bureaucrats, and opportunistic politicians across the United States. As usual, Europeans have not been slow in copying the latest fad from America. While a recent European Union Commission report recommends following the Californian "free-market" model for building the "information superhighway," cutting-edge artists and academics eagerly imitate the "posthuman" philosophers of the West Coast's Extropian cult.' (ibid: 364)

According to feminist utopian scholar Sargisson (2012a), "[t]he word 'utopia' phonetically conflates an etymological pun on three Greek terms: 'eu', good, 'ou', non or not, and 'topos', place. Utopia is thus the 'good place that is no place', or the 'good-no-place', or the 'good place that is not'."

For Kumar (1987, 1999), utopia is first and foremost a form of fiction of imaginary worlds. His definition is perhaps the strictest, since he claimed that there is only one utopia, i.e. "the modern western utopia invented in the Europe of Renaissance." Nevertheless, the modern utopia has inherited classical and Christian traditions, e.g. the Golden Age, Arcadia, Paradise, Cockaygne, the millennium and the Hellenic ideal cities, all perfect worlds.

Kumar (1987) listed More's Utopia, Campanella's City of the Sun, Andreae's Christianopolis and Bacon's New Atlantis as classics of positive utopia (eutopia). Meanwhile, the satirical strand in utopia has developed on its own and formed a negative pole, i.e. dystopia or anti-

utopia, to show the extremes of folly and unreason. The dystopias range from Swift's Gulliver's Travels to Orwell's Nineteen Eight-Four.

In particular, scientific utopias (or dystopias), e.g. Huxley's Brave New World, can point out particular areas of techno-social concern and "warn us about issues and patterns that we can still change. (Sargent 2005: 47-49) Levitas (2010) proposed that 'the expression of desire for a better way of being' will remain a common factor in all kinds of utopias.

Furthermore, literature professor Moylan (1986: 1-2) has identified what he calls 'critical utopia' mainly according to utopia's function and social value. 'Utopia negates the contradictions in a social system by forging visions of what is not yet realized either in theory or practice. In generating such figures of hope, utopia contributes to the open space of opposition.'

Moylan (ibid: 10) said that utopia as a literary genre once fueled the early capitalist dream of a new world, and, working within the oppositional ideologies, has helped pushing beyond that dream. However, utopia's power to drive change was subdued in the 20th century, because it was coopted into the maintenance of the totalising systems, from the Stalinist state to the consumer paradise, such as Disneyland, which is one of the more surveilled places on earth.

Suvin (2003) said that Disneyland fairy tales are an 'exemplary (bad) case of a dystopian misuse of eutopian images.' If utopia prompts imagination of alternative futures, then the disneyfication of utopia kills it.

In recent years, there have been some interesting research on the literary utopia's or science fiction's contributions to human-computer interaction (HCI) and ubicomp designs, including the designs of QS gadgets, promoting the use of design fiction for creating alternative technological futures. (Satchell 2008; Blythe 2006, 2014a, 2014b; Markussen, Knutz 2013; Sterling 2009) Personal and Ubiquitous Computing journal recently dedicated an entire issue to the relation between science fiction and ubicomp. (Kaye, Dourish 2014). Julian Bleecker (2009), an interaction designer at Near Future Laboratory, has pointed out that HCI designs are often constrained by pre-existing and predominant metaphors made popular by Hollywood sci-fi movies, such as Minority Report's impact touchscreen designs.

2.4.2 QS as utopia

The connections between the QS and utopia can be understood through Foucault's ideas on the utopian body and the technology of the self.

First, Foucault (2006) considered the human body as 'the principal actor in all utopias,' or that whose senses, especially the visual, give rise to all human impulses and wishful thinking. But the utopian impulses are locked inside the body, so, historically, masks, tattoos, makeups and clothes were used to launch the body into an other space to free up the imagination. "Everything that touches the body … lets the utopias sealed in the body blossom into sensible and colourful form."

The above description fits the QS gadgets well. For example, wearing a Nike Fuelband on a wrist to record body data, the QSer is stimulated to fantasise about the futures of their body, self and good life. Those which were invisible, e.g. heart beat, and to which the person was insensible, e.g. eating habits, are made visible and sensible by the gadgets' pattern recognition algorithms through quantification, evaluation and visualisation. The evaluated, qualitative data then assemble the QSer's 'data-doubles', which facilitate shaping the QSer's inforg identity.

Second, in the Western tradition, an important technology of the self is self writing (hupomnemata): a person writes down daily activities with great details in order to derive moral lessens, guides for conduct and a genealogy of thoughts. (Foucault 1983b) Similarly, the QSers draw up their lifestyle guide to the digital galaxy based on their self-data. Their posthumanism ideals and implicit models about life and society are implied and embedded in these guidelines.

Sargisson (2012a) defines utopianism as a human impulse or tendency based on dissatisfaction with and critique of the present; it engages in contemporary social and political debates; and it desires and imagines alternative possibilities to the status quo. Utopias are manifestations or expressions of utopianism. They come in many forms including texts (fiction and theory) and lived experiments. By stretching the critique of the present to extremes, people either come up with an imagination of a better society (i.e. eutopias) or of a worse one (i.e. dystopias). (See Figure 2.)

Some QSers also articulate their own theories about why certain things happen, e.g. why their body weights increase, what should be done about it, and what should take place ideally.

These are utopian fictions and theories in Sargisson's model, and they can be found in QSers' online discussions and during the show-and-tells.

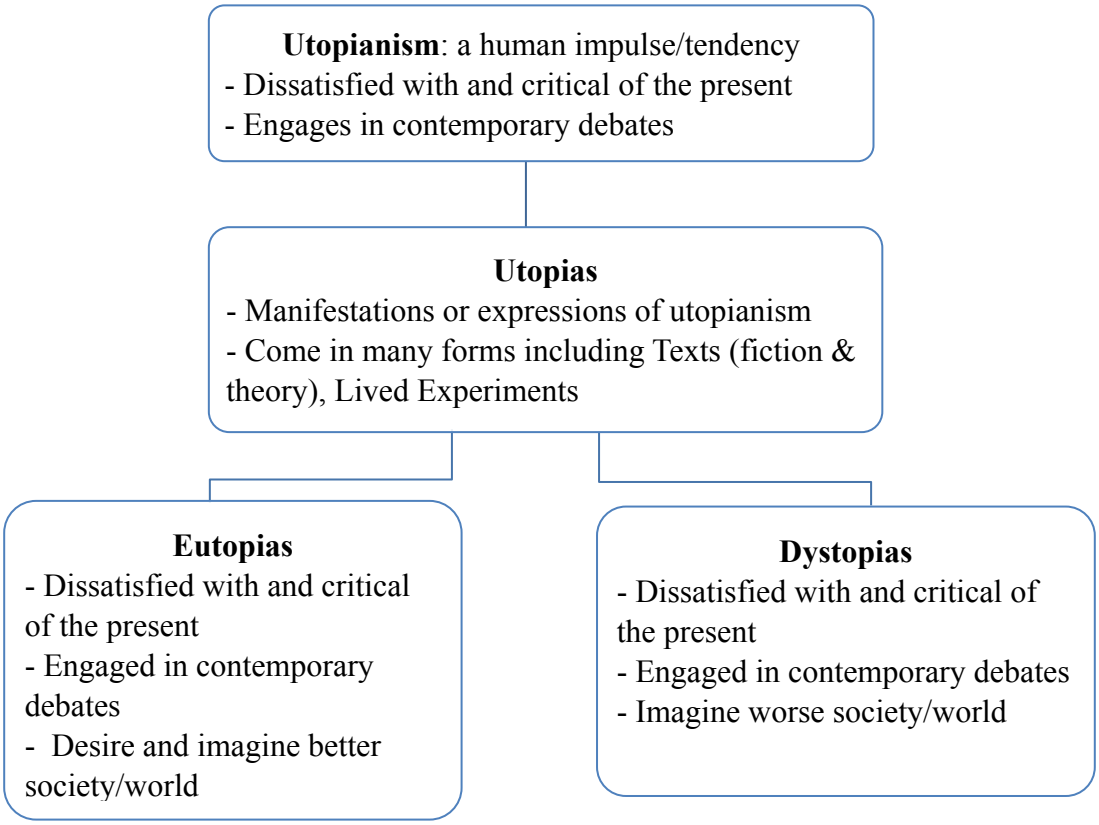


Figure 2. Sargisson's model, reproduced from (2012a: 9)

Meanwhile, the self-trackers do not only think, they do. They use their body data to examine how they follow their self-imposed, metrics-defined everyday life regimes and thus conform to their ideals. These attempts to make changes and realise the good self, driven by utopian impulses, are the lived experiments.

2.4.3 Two QS cases

In this section, I will review two types of self-tracking apps, i.e. those for quantifying sexual and reproductive functions and behaviors and for keeping logs of body weight.

2.4.3.1 Quantified sex

Self-tracking fertility apps target both women and men, according to Lupton (2015a). The female-oriented apps track women's body data to predict their ovulation and menstrual cycles in order to either facilitate or avoid conception.

Many of these apps are designed for helping female users know their own 'best time to mate,' thus boosting fertility rates for those with reproductive difficulties and serving to chart a

roadmap to a eutopia of 'easy pregnancy.' However, if we stretch such an ideal of reproduction under self-surveillance, then it could turn into a dystopia depicted in Morrow's *Auspicious Eggs*, where ideology and state-sanctioned forces combine to monitor and control reproduction. (Sargisson 2012b)

The male-oriented apps gamify sexual activities and put emphasis on male performance and achievement. They keep logs of number of partners, locations, duration, thrusts per minute, noise levels and etc.

Lupton (2015a) said, "These technologies, therefore, act to support and reinforce highly reductive and normative ideas of what is 'good sex' and 'good performance' by encouraging users to quantify their sexual experiences and feelings in ever finer detail and to represent these data visually in graphs and tables. The discourses of performance, quantification and normality suggest specific limited types of sexualities."

2.4.3.2 Weight control apps

The same reductive and normative logic can also be found in weight control apps. Many of these apps simply transform their users into objective units of calorie intakes and burning. Thus, these QS apps, in effect, suggest that complex weight management can become as simple as manipulating a few sets of data and meeting arbitrary body mass index (BMI) standards.

Despite various social and medical perspectives on weight issues, from anti-obesity structuralist approach to fat pride activism (c.f. Lupton 2013d), most fitness apps just adopt the dominant view of fighting against "obesity epidemic," emphasising personal responsibility and self control.

Sociologically, many competing, collaborating social forces are contributing to obesity discourse (ibid), and app developers are inevitably influenced by them, or piggyback on them to market and promote their products. Similar to Bleecker's metaphor problem mentioned in Section 2.4.1, a totalising obesity discourse can foreclose possibilities for alternative designs and lead to product homogeneity.

2.5 Research questions

Having reviewed the literature about the linguistic, social, cultural, political and technological contexts in which the Quantified Self is situated and from where it arises, I put forward my research questions as follows.

Since no linguist or discourse analyst, to my best knowledge, has systematically examined the relations between the QSers' discourse and their mind, my study aimed to fill in this gap by collecting and analysing a proprietary corpus of 40 QSer blogs, and map out the cultural model of the quantified self in this discourse community. This approach was possible because according to the Conceptual Metaphor Theory (CMT), the abstract concepts people use in everyday life are structured by complex conceptual metaphors, which are composed of primary metaphors that are embodied in the human nervous system, including the brain, and embedded and extended in their bodily experience in the world (Lakoff and Johnson 1999: 16-73). The conceptual metaphors are an "essential part" of the concepts (ibid: 73). Therefore, by studying systematically the metaphors the QSers used in their blogs, I was drawing a picture of their (collective) mind, mapping out their self-related cultural models and schemas, or thought patterns. Meanwhile, since the conceptual metaphors are not directly accessible, 'the main way of identifying them has been through' clusters of linguistic metaphors (Deignan 2010: 52), or 'metaphorical expressions' (Lakoff 1993: 203).

Hence my research questions in this thesis,

I. *What linguistic and conceptual metaphors did the QSers use in their blogs ?*
II. *What concepts did they hold as regards* self, data *and* self-control *?*

3. Methodology

This section will explain some of the cognitive linguistics (CL) methods I will use to analyse the metaphors in the QS discourse. First, I will explain how I have decided to use a CL-informed discourse analysis approach.

Earlier research on self-tracking were carried out by health researchers in the areas of tele-health, e-health and m-health, mainly studying clinical benefits of self-tracking technologies in treatments of illness. Later, sociologists have brought in a different analytical approach, focusing on "understanding the use of these technologies in relation to notions of the self and group and individual identity formation and with an emphasis on fitness rather than illness." (Till, 2006) Besides, the first QS research network was launched by sociologists Christopher Till and Mark Carrigan at the University of Leeds in the UK in 2013. (University of Leeds, 2013) Meanwhile, political theorist Lucy Sargisson (2014) argued that the QSer have bought into a sham utopia, which purportedly promotes self-perfection, but actually represents corporate's and government's agenda.

So far, no linguist has tackled the problems on the QS language and identities, but it does not mean they cannot. "Research in various fields such as psychology, sociology… has now firmly established the fundamental role of language processes and strategies in the construction, negotiation and establishment of identities," said Polish applied linguist Kamila Ciepiela (2011), asserting, "language and identity are inseparable." So it is not only possible but also necessary to study the QS identities using a linguistics approach.

Specifically, my theoretical orientation is cognitive linguistics (CL), especially the Conceptual Metaphor Theory (CMT) and mental spaces blending theory, as both the concepts of quantification and self are abstract and contested, and they need to be grounded in embodied experience for people to understand and for themselves to propagate. Since the CMT, and CL in general, have started with embracing and developing the idea that both language and thinking are embodied, they are especially suitable for studying the complex system of how the abstract ideas and concepts of the QS are embodied. Also, as psycholinguist Margaret Dowens suggested,[31] CL has a methodological advantage over psychological experiments, because CL can study various discourses in a large range of contexts on the Internet, whereas psychological experiments will need controlled

[31] Personal communication during PhD annual review.

environment and structured questionnaires and interviews. The third reason for choosing a CL approach is because my study subject is multimodal (linguistic, visual, auditory, haptic, etc). The embodiment statement has literally put the language on the same ground with the other cognitive capacities, so the CL will be more useful for identifying potential connections among different modes of communication and persuasion (e.g. linking verbal metaphors with the photos we see in an advertisement through mental image schemata.)

In the rest of the chapter, I will explain in details how a cognitively-informed discourse analysis method, developed by cognitive linguists Gerard Steen, can work for my research.

3.1 CMT and cognitively-informed discourse analysis

I am using Steen's CL-informed discourse analysis to help me answer my first research question. Here I will explain why and how. In the 1980s, two of the cognitive linguistics cofounders, George Lakoff and Mark Johnson, wrote several classic books, including Metaphors We Live By and Women, Fire and Dangerous Things, which serve as the foundation of the Conceptual Metaphor Theory in cognitive linguistics. (Lakoff and Johsnon, 1980; Lakoff, 1987) Their basic argument is that humans think mostly and essentially in metaphors, and these conceptual metaphors are not innate software in the brain, but are rather embodied in humans' worldly experiences. As Lakoff and Johnson put it in Philosophy in The Flesh (1999), 'The mind is inherently embodied, reason is shaped by the body.' This is because, as cognitive linguist Charles Forceville (2006) interpreted it,

> 'Human beings find phenomena they can see, hear, feel, taste and/or smell easier to understand and categorize than phenomena they cannot. It is perceptibility that makes the former phenomena concrete, and the lack of it that makes the latter abstract. In order to master abstract concepts, humans systematically comprehend them in terms of concrete concepts.'

An abstract concept of, say, time is systematically understood as a substance, an object moving in space, a resource, a person and so on. Life is understood as a journey, a story and so on. Conceptual metaphors also differ from linguistic metaphors. For example, the following linguistic expressions: The time for action has arrived; Time is flying by; He passed the time happily; all reflect an implied or underlying conceptual metaphor, that is, TIME IS SPATIAL MOTION. (Forceville 2006)

Moreover, according to the CMT, a conceptual metaphor consists of a target domain (topic, tenor) and a source domain (vehicle, base). ‘A metaphor’s interpretation boils down to the “mapping” of pertinent features from the source to the target.’ (ibid) An example from Lakoff is the conceptual mapping of the metaphor LOVE IS A JOURNEY, which may include: The lovers correspond to travellers; The love relationship corresponds to the vehicle; The lovers' common goals correspond to their common destinations on the journey; Difficulties in the relationship correspond to impediments to travel. (Lakoff 1993: 207) Many metaphors have become entrenched after repeated use, so a mapping in the case of entrenched metaphors, such as I’m at a crossroads in my life (LIFE AS A JOURNEY) or I was overwhelmed (EMOTION AS FORCE), occurs automatically. (Forceville 2006) As we can see (which is another entrenched metaphor), metaphorical source domains are deeply rooted in the functioning of the human body, thus grounding our thinking on a human scale. This is what the CMT means by ‘reason is shaped by the body.’

3.1.1 Embodied, enacted metaphors

In a 2003 Afterword to their 1980 classic Metaphors we live by, Lakoff and Johnson (2003: 244-274) explicated a neural theory of metaphor, developed by computer scientist Srinivas Narayanan (1997). They wrote,

‘Narayanan developed a theory in which conceptual metaphors are computed neurally via neural maps—neural circuitry linking the sensory-motor system with higher cortical areas.

…

The maps or mappings are physical links: neural circuitry linking neuronal clusters called nodes. The domains are highly structured neural ensembles in different regions of the brain.

…

Metaphor is a neural phenomenon. What we have referred to as metaphorical mappings appear to be realised physically as neural maps. They constitute the neural mechanism that naturally, and inevitably, recruits sensory-motor inference for use in abstract thought.’ (Lakoff, Johnson 2003: 255-258)

Thus, they have put the embodiment thesis of conceptual metaphor more concretely and precisely in human neural system, mainly the brain. Elsewhere, Lakoff (2008b: 18) has stated more explicitly, making the brain centrally important. ‘Every action our body performs is controlled by our brains, and every input from the external world is made sense of by our

brains. We think with our brains. There is no other choice. Thought is physical. Ideas and the concepts that make them up are physically "computed" by brain structures. Reasoning is the activation of certain neuronal groups in the brain given prior activation of other neuronal groups. Everything we know, we know by virtue of our brains. Our physical brains make possible our concepts and ideas; everything we can possibly think is made possible and greatly limited by the nature of our brains.'

Lakoff also explained, in this line of reasoning, what the shaping of brain meant 'Each neuron has connections to between 1,000 and 10,000 other neurons. Between birth and age five, roughly half of the neural connections we are born with die off. The ones that are used stay; the others die. That is how the brain is shaped, and such a shaping is necessary if the brain is to learn to do the huge number of things it does.' (ibid)

Furthermore, the neural theory posited that metaphors were not only embodied, but also enacted and dynamic. Lakoff and Johnson (2003) wrote,

'We will use the term enactment for dynamic brain functions shared both during perceiving and acting and during imagining. An enactment, real or imaginative, is dynamic, that is, it occurs in real time.

…

Fixed concepts are neural information structures called neural parameterzations that can guide imaginative enactments when activated. Conceptual metaphors, at the neural level, link source domain parameterizations to target domain parameterizations. By this means we can carry out metaphorical enactments—forms of imagination in which abstract reasoning is governed by sensory-motor enactments unfolding in real time and in real contexts. Multiple enactments are always being carried out by the brain, and single enactments can be guided by multiple parameterizations. Consequently, target domain enactments can be governed by multiple metaphors. This explains why there are complex metaphorical sentences like *I've fallen in love, but we seem to be going in different directions*. Here a number of metaphors structure the enactment: Lack of Control Is Down, as with "fall"; States Are Locations, as with "in love"; Changes Are Motions, as when falling in love is characterized as a change to a new state; and Love Is A Journey, as when lovers may be "going in different directions."

…

In Narayanan's model (1997), parameterization gives rise to what we will call structural inferences, which characterize static inferential structure. Enactment inferences arise, on the other hand, only in the unfolding of a dynamic process.

…

The enacted inferences are embodied; as such, they are carried out in the source domain. Their effects are mapped to the target domain and hence to the discourse space.' (ibid: 258-261)

Drawing on the critical concept of 'mirror neurons,' Lakoff (2008b: 19) also wrote, 'Simulation semantics is based on a simple observation of Feldman's: if you cannot imagine someone picking up a glass, you can't understand the meaning of "Someone picked up a glass." Feldman argues that, for meanings of physical concepts, *meaning is mental simulation*, that is, the activation of the neurons needed to imagine perceiving or performing an action. One thing we know is that not all imagination or memory is conscious, and so not all mental simulations are. That is why we typically have no conscious awareness of most such simulations.'

The embodied and enacted metaphors were also used by QSers in their blog discourses. This is because, arguably, in order to make sense of, or meaning out of, their daily experiences interacting with the digital devices and cyberspace, whose operations were mostly abstract entities that required imaginative thinking to understand, they had to make use of their embodied, though unconscious, simulations from previously basic and nonverbal experiences, already packaged as neural parameterzations (i.e. the neurons that wired together because they had repeatedly fired together under certain circumstances). That is, the digital subjects must have stimulated and activated the QSers' multiple neural parameterzations, both enabling and constraining the QSers' reasoning and sense-making activities. The following are a few concordance line examples from some of the more prototypical texts from my QS blog corpus. The italics are the lexical units whose metaphoricity potentials can be activated or construed by a metaphor analyst.

From 012_05_2:

1. Splunk to *track* data from devices including a Fitbit, a Nike Fuelband, a Basis Band, and
2. every time I *save* a new measurement Splunk automatically *reads* and *indexes* the
3. Step 3: *Indexing* the CSVs *In* Splunk I *navigated* to: "Settings" > "Data Inputs" > "Fil

4. *index* data from a *file* or *directory* this Splunk instance can *access*".
5. a number of tracking devices and I use Splunk to *analyse* the data they *produce*.

From 022_10_3:

1. *Then I *cd into* the mmal *directory* and *run* the sleeplogger.py *script*[32]
2. Then I *brought* my Macbook *in* and *started* an SSH session into the
3. briefly ran into a problem: whenever I *launched* raspistill it would *hang*.
4. I *hooked everything up*: Here is my finished Arduino *sketch*, which *tells* the Arduino to
5. that it is very easy to *get* the Arduino to *send* values to the Pi *via* a
6. I had most of these components already *laying around from* other projects

From 033_17_1:

1. *Run* this app *on* your tessel and *send* yourself a *text message*.
2. it's been more than 5 minutes we *call* the sendText *function* we *wrote* earlier to *notify* you
3. *wrapping* this code in a *function* called sendText(). If you've *worked* with the Twilio
4. we've *tested* our app let's *use* the tessel *push* command to *push* our app *into* Tessel's
5. We successfully used the Tessel to *enter the world* of #DogHacking. What's next?
6. *position* of the x-axis *on* our accelerometer. We're *trimming* this *position* to 1 decimal

From 050_23_3:

1. I am Twitter *addict*, my Twitter *account*, @zzap, also *tweets* my daily Fitbit *steps*.
2. a Fitbit One and *loving* it, when the Fitbit Flex *came out* I decided to upgrade to
3. decided to upgrade to that and *retire* my Fitbit One.
4. *smart* tech and *crowd-funding solutions* like Kickstarter, pet oriented *life tracking* is
5. This device, similar to a Fitbit *solution*, *concentrates* on *tracking* the pets activ

From 056_28_1:

1. H7 heart rate monitor *paired* with the SweetBeat HRV app on my iPhone, along with my
2. Heart Rate Variability *uses* a *technique* in whic
3. an inverse *relationship* between heart rate and HRV, which *makes sense*

These potential metaphorical units, mainly verbs and nouns but also prepositions, indicate how previously basic or primary human nonverbal experiences, such as manipulating objects, moving in a physical space and interacting with other humans in different ways, already

[32] I include an outlier here, because *cd into* is, roughly speaking, not a metaphor mapping from basic nonverbal experience only. It is mainly a direct borrowing from the computer command line, however, *into* sill points to a basic spatial or container metaphor, that is, DATABASE/CYBERSPACE IS A CONTAINER/PHYSICAL SPACE, but entering it takes new, disembodied ways. In other words, it is a mixed space.

packaged as neural parameterisations, could be recruited to help the QSers apprehend novel experiences and construct self-conscious meanings from them. Personification of the digital subjects is a classic trope, making them more familiar and easier to describe and comprehend. (Admittedly, some of these cyberspace metaphors are already conventionalised for the Web users after a few of generations. Technically, we are now already in the 5th generation of mobile communication technologies.)

3.1.2 Five steps to identify conceptual metaphor

However, the Dutch cognitive linguist Gerard Steen (1995) rightly pointed out that Lakoff and his colleagues did not spell out how they have arrived at the conceptual metaphors from the linguistic ones. So he took the CMT, did a reverse engineering to it and has invented a systematic and relatively constrained method that can go from linguistic to conceptual metaphors in five steps. In developing this method Steen has mainly borrowed from an American cognitive psychologist George A Miller's (1993) classification of metaphors. Since my research direction is from tracing the QS discourse (linguistic expressions) to the conceptual schemas embedded in the Quantified Self, this method will be helpful.

The first of Steen's five steps to identify a conceptual metaphor in discourse is to identify the nonliteral part, called the focus, in a sentence. For example, in the sentence 'The mermaids ride on the waves,' the predicate *ride* on does not have any literal referent, while the two arguments it takes, the *mermaids* and the *waves*, do. Therefore, ride on is the focus. The second step is to construct a proposition of the metaphor, including a predicate and its arguments (the literal and nonliteral parts). The third step is to rewrite the metaphorical proposition according to the metaphorical rewrite rules, which Steen borrowed from Miller, for nominal, verbal and sentential metaphors, respectively. After the reconstruction, the conceptual comparisons between the target and source domains underlying the metaphors are revealed. For notation, Steen uses function F(x) to represents the target domain and function G(y) to represent the source domain. Here are the first three steps in summary:

(1) Metaphor focus identification: find out the nonliteral part (focus) in a sentence;

(2) Metaphorical idea identification: construct a proposition of the metaphor, including a predicate and its arguments (the literal and nonliteral parts);

(3) Nonliteral comparison identification: rewrite the metaphorical proposition according to respective metaphorical rewrite rules, i.e. M1 (for nominal), M2 (for

verbal), M3 (for sentential), in order to reconstruct the conceptual comparisons underlying the metaphors.

I reproduce Steen's (Miller's) rewrite rules here (Steen 1995: 66-68),

a. M1. BE (x,y) –> (?F)(?G) {SIM [F(x), G(y)]}

b. M2. G(x) –> (?F)(?y) {SIM [F(x), G(y)]}

c. M3. G(y) –> (?F)(?x) {SIM [F(x), G(y)]}

On the left-hand side of the rules are propositions, which contain the functions and entities already known in the sentence. On the right-hand side, the analogy is made explicit, and the unknown functions and entities are waiting to be filled in.

The first three steps of the identification are quite constrained, but the last two steps will involve some interpretation, and more so for the last step than for the fourth step. The fourth step is to fill in the empty slots, the unknown parts, in the conceptual comparison just identified in step three. This often relies on the canonical frames or according to the context. The last step is to complete the conceptual mapping between the source and target domains.

(4) Nonliteral analogy identification: fill in, or solve, the empty slots in the comparison formulae, often relying the canonical frames or according to the context (e.g. PERFORM (y, y') could be filled in as PERFORM (poor, duties), PERFORM (actors, roles), or both (a pun).)

(5) Nonliteral mapping identification: complete the conceptual mapping between source and target domains.

Below, I take an example sentence from Steen (1995) and identify the conceptual metaphor in it following his 'Five Steps.'

Sentence: I have seen the mermaids riding seawards on the waves (T.S. Eliot, The love song of J. Alfred Prufrock)

(1) Nonliteral: mermaids RIDING ON waves

(2) Proposition: RIDE ON (mermaids, waves)

(3) Comparison reconstruction:

RIDE ON (mermaids, waves) –> (?F) (?y, y') {SIM [F(mermaids, waves), RIDE ON (y, y')]}

(4) Completing analogy:

SIM [FLOAT(mermaids, waves), RIDE ON (people, horsebacks)]

(5) Completing conceptual mapping:

THE MERMAIDS-AS-PEOPLE MAPPING:

Figure:

The mermaids correspond to people.

Ground:

The waves correspond to horsebacks.

The rises and falls of the waves correspond to those of the horsebacks.

The mermaids' movement toward a direction in the sea correspond to the people's movement on the road.

As you can see in Step 4, I have chosen to fill in the source domain function as RIDE ON (people, horsebacks) according to my own interpretation and the context, or background (c.f. Searle 1983). I have made such a decision because the source domain should be rooted in everyday human experience and close to the human body. Typically, a human rides on a horse or horseback (to be more specific), hence the solution. Of course, a human can ride on a donkey, a buffalo or other animals, but they are not so typical, as far as I am concerned. An analyst hailing from a donkey-riding region may differ. Thus, I have explained and demonstrated the use of Steen's analytical method.

3.2 Applications of method

In this section, I will demonstrate my applications of Steen's five-step method to identify the conceptual metaphors in the QS discourse. These identifications are preliminary and are by no means systematic, so they will likely be modified, updated or discarded later. But for now, they serve the purpose of illustration well.

3.2.1 Individual metaphor snapshots

First, in this section I demonstrate how Steen's metaphor identification procedure can be applied to taking snapshots of individual linguistic metaphors in discrete clauses from the QS blog texts, and establishing the source-target domains conceptual mappings therein. In the next section of 3.2.2, I will discuss a more dynamic view of activation and transformation of connected metaphors in QS blogs.

The following demonstration clauses of a, b, c are taken from Stanke (2014, online)

a. Where My 90 Hours of Mobile Phone Screen Time In September Went

(1) Nonliteral: time WENT somewhere

(2) Proposition: GO (time, somewhere)

(3) Comparison reconstruction:

GO (time, somewhere) –> (?F) (?y, y') {SIM [F(time, somewhere), GO(y, y')]}

(4) Completing analogy:

SIM [BE SPENT IN(time, somewhere), GO(person, somewhere)]

(5) Completing conceptual mapping:

THE TIME-AS-PERSON MAPPING:

Figure:

The time corresponds to the person.

Ground:

The (virtual) place where an activity happens corresponds to the destination the person goes to.

The spending of the time corresponds to the movement of the person in space.

This is a headline from a blog piece on using the app Trackerfy to measure the blogger's time use on a Samsung Note 3 pad over the period of a month. The identification here shows clearly that the linguistic expression links to one or two of the conceptual metaphors of time, i.e. TIME IS A PERSON or TIME IS A MOVING OBJECT IN SPACE.

b. 90 hours is a ton of time to be staring at a 6-inch screen.

(1) Nonliteral: a TON of time –> time is a TON

(2) Proposition: BE (time, ton)

(3) Comparison reconstruction:

BE (time, ton) –> (?F) (?G) {SIM [F(time), G(ton)]}

(4) Completing analogy:

SIM [LASTS LONG (time), WEIGHS HEAVY (ton)]

(5) Completing conceptual mapping:

THE TIME-AS-TON MAPPING:

Figure:

The time corresponds to the ton (a metric unit standing in for a heavy substance).

Ground:

The duration of the time corresponds to the weight of the ton.

The (psychological, economic) value of the time corresponds to the (physical, measurement) value of the ton.

This expression belongs to another time metaphor, that is, TIME IS SUBSTANCE, and, perhaps, a very valuable (as suggested by its heaviness) substance, such as gold. Since for a long time in history, gold is equivalent to money, through the linking principle (Lakoff 1987: 12-57), the expression can also belong to the category TIME IS MONEY.

There are more expressions from the same weblog (Stanke 2014, online) that represent, perhaps more typically, the concept TIME IS MONEY, and I list them below:

1. No way am I spending that much time using my Samsung Note 3.
2. I spent just a tad under 90 hours using my mobile device in September.
3. I spent 32 hours watching streaming video on my device.
4. I spent just under two hours using my device for gaming
5. I only spent 40 minutes all month online shopping using the Amazon app.
6. I spent the same amount of time (40 minutes) managing my fantasy football team.
7. I spent almost two hours checking weather forecasts.
8. Five and a half hours cruising Facebook is the biggest waste of time ever.
9. No value and disappointed it got to #6 on the top ten list.

As we can see, the verb spend is the predominant predicate-structure here, but the nouns waste and value in the last two items also make obvious connections to the metaphor TIME IS MONEY.

c. I used an app called "Trackerfy" that basically sits in the background and tallies up the different apps you use and for how long.

(1) Nonliteral: Trackerfy TALLIES UP apps

(2) Proposition: TALLY UP (Trackerfy, apps)

(3) Comparison reconstruction:

TALLY UP (Trackerfy, apps) –> (?F) (?y, y') {SIM [F(Trackerfy, apps), TALLY UP (y, y')]}

(4) Completing analogy:

SIM [RECORD ACTIVITY OF (Trackerfy, apps), TALLY UP (person, numbers)]

(5) Completing conceptual mapping:

THE TRACKERFY-AS-PERSON MAPPING:

Figure:

Trackerfy corresponds to the person.

Ground:

Trackerfy's recording corresponds to the person's writing down (the numbers).

The multiple apps correspond to the many numbers (on a bill, a scorecard, a voting record, etc).

The duration of an active app corresponds to the value of a number.

The addition (a mechanic function) of the apps' active durations corresponds to the addition (a cognitive function) of the numbers' values.

Not only Trackerfy is a person, but there are more apps that are personified in the QS discourse from another source (Anderson, R. J. 2014, online). APPS ARE PEOPLE, or even FRIENDS.

1. The Trackerfy app doesn't lie.

2. Communication apps such as Hangouts, Gmail, and the Phone made up 18 hours of time.

3. Sleep Cycle doesn't help me get out of bed, which is a problem, but I think it's me, more than the app.

4. Before going with Fitbit, Moves did serve as a great pedometer, but now that feature is quadruply redundant between the Fitbit app, MyFitnessPal, DayOne for iPhone, and Reporter app tracking my steps.

5. As it stands, Moves is just one more thing sucking up battery.

6. Mint is actually very helpful, especially since I'll be renting an apartment again and need to keep a closer eye on my finances.

As Steen (1995: 59) has suggested, after the identification, there could be another, the sixth, step, that is, to compare and connect the conceptual metaphors found out individually to form a coherent, systematic metaphor network. In the network, we can further identify some patterns, such as that which metaphors are predominant (or have been used, or referred to, more frequently than others) in the system, and that different self-trackers may have shared some metaphors at different levels of the metaphor hierarchy, e.g. whether at a higher level of TIME IS SUBSTANCE or in its sub-category TIME IS MONEY.

The entailment of this is I need the assistance of a QS discourse corpus, which will help indicate the frequencies of use of each conceptual metaphor in the overall QS discourse. Since there was none, I built such a corpus by myself, and I used a method to sample a representative text from the corpus for close reading, which will be discussed in Chapter 4.

3.2.2 Dynamic metaphor activation, transformation

All of the QSers I have analysed in my corpus did self-tracking for lifestyle purposes, rather than being prescribed by a doctor to do self-monitoring for curing a disease. Nevertheless, personal change for a better, more ideal, balanced and efficient lifestyle, or life-optimisation, is still a major theme, such as weight loss. In a blog entry, titled Quantified Self: 3 Months Later (File 002_01_2), an avid QSer reported what they did to shed over 15 pounds in three months and how they felt.

Theoretically, a change in physical states can lead to a change in mental states. Losing weight in itself may change how people use language to describe themselves and their experiences. Also, in a top-down neural activation fashion, some of the QSers may use language and metaphors to help them shape up, priming themselves in such a way so that they can imagine a fitter physical state and pay closer attention to bodily functions and feelings. In other words, physical changes may correspond to dynamic metaphor transformations, coming from both bottom-up and top-down neural activations.

Therefore, in this section, I briefly demonstrate tracing through the dynamic metaphor transformations made by a fitness QSer in a medium-length show-and-tell blog (1194 words). Compared with the methods to be discussed in Chapters 4 and 5, this demonstration applied a relatively simplistic method, by mainly concordancing the keywords of *me*, *myself*, *my*, *self* and *I* (yielding 113 concordances in AntConc) and identifying the metaphors used in their co-texts. To set up the scene, I first present below the opening paragraphs of the blog, which QSer wrote enthusiastically.

‘At the beginning of July, I began my experiment with the quantified self, and three months later, I’m happy to report: This. Shit. Works. Metrics on physical activity, eating, and sleeping have helped me make better decisions and develop new healthy habits that I can sustain going forward. In other words, my data is helping to change my default behaviors. I surpassed my goal of losing 15 pounds in 3 months, and I did it without going paleo or committing to an exercise regimen designed to make me puke.

I devised just three simple rules that I could follow every day without feeling to[sic] constrained:

Burn more calories each day than you consume.

Get at least 10,000 steps with Jawbone UP every day.

Weigh in before breakfast every day.'

The rest of the blog text was divided into five sections, namely 'Pick a KPI,' "Many Paths to Success,' 'Spend Your Resources Wisely,' 'Combine Short-Term and Long-Term Goals,' 'What's Next?' I make a selective list of concordance lines below, following the textual staging order. The italics are potentially metaphorical lexical units, and my construals of their corresponding conceptual metaphors and source domain inferences are in the squared brackets trailing behind the concordance lines.

Pick a KPI

1. I was looking for a way to lose weight and *keep it off*.
   [WEIGHT IS AN INVADER TO WELLBEING. Losing weight for the QSer three months before was framed as competition or fight. Given that body weight is also a metonymy for the QSer's bodily self, they did not seem to be happy with their self-image in the consciousness.]
2. With the *combination* of hardware and software from RunKeeper, Jawbone, WiThings, and MyFitnessPal, I had data on every relevant metric
   [DIGITAL SUBJECTS ARE BOXING MOVES. This is a sport metaphor. Since the QSer was ready to go into a fight, they needed some effective moves and techniques as their weapons.]
3. I *picked* my KPI: calories.
   [CALORIES ARE OPPONENT IN WAR ON WEIGHT. In order to be effective and efficient, the QSer chose to focus on a targeted opponent.]
4. your body will turn to its other *reserves* (namely, fat) for energy. This leads to weight *loss*.
   [BODY IS AN ARMY. WEIGHT IS ENEMY. These are related war metaphors, and the QSer was imagining a (straightforward, linear) success, winning against their negative self-image.]

5. The amount of daily exercise and the dietary mix was entirely my *decision*.
   [QSER IS A COMMANDER. In order to help them make progress, the QSer also created a positive self-image of being in control and resolute.]
6. Every morning before breakfast I *weighed in* on the WiThings Smart Body Analyzer
   [QSER IS A BOXER/FIGHTER. The QSer performed a boxing ritual every morning, perhaps boosting their morale in order to persevere. The ritual was also precise and involved money or other resources.]

Many Paths to Success

1. I started looking for *ways* to *insert* more steps *in* my day, and there were plenty.
   [TIME IS PLACE TO BE CONQUERED. The QSer needs to conquer every day on the way to their triumph over weight. It took some effort to arrange daily physical activities.]
2. As an *optimizer*, I've historically looked for *ways* to *minimize* travel time.
   [QSER IS A RESOLUTE CONQUERER. Both *optimiser* and *minimize* implied absoluteness in will, hence determination (in Latin, optimus means the best, and minimus means the least.)]
3. Now I *optimize* for steps.
   [Demonstrating resolution again.]
4. The UP platform *pits* you *against* yourself, much the way HubSpot does, constantly *challenging* you to improve.
   [ME AND MYSELF ARE ENCLOSED ANIMALS FIGHTING EACH OTHER. The QS apps and platforms not only help the QSer to change, but also add pressure on them, making the transformation an imperative: You must be fit !]
5. 'What's the highest number of steps I can *fit in* a single day?' (So far, it's 37,416.)
   [TIME IS SOCIAL SPACE THAT HAS STRICT REQUIREMENTS. More pressure.]
6. The UP app became my *central hub* for quantification, so much so that I redesigned the app.
   [APP IS A WHEEL OF A MILITARY VEHICLE TO HELP QSER CONQUER WEIGHT. App also gravitates QSer's attention towards the metrics.]

Spend Your Resources Wisely

1. Learning how many calories were in different meals and foods had a strong *impact* on my eating and exercise habits.

   [KNOWLEDGE IS FORCE/POWER.]
2. Constant awareness of my calorie intake also *impacted* my exercise.

   [KNOWLEDGE IS FORCE/POWER.]
3. Beer was something to be *earned*, *not guaranteed*.

   [CONSUMPTION IS LABOUR. There is no welfare, so be a prosumer.]
4. There were nights when I had to *say no to a drink* because I wanted the *good weigh in* the next morning.

   [FITNESS IS SELF-DISCIPLINE.]

Combine Short-Term and Long-Term Goals

1. This gave me a reason to *get off my ass* and run more.

   [SITTING IS A GUILT.]
2. I spent $20 to *upgrade* my RunKeeper account to *Elite* status so I could get more data analysis.

   [QSER IS A MACHINE. As the QSer made progress, their self-image also started to improve, replacing the old image with new, higher-status-signifying components — hyperbole.]
3. I know some people go running for the solitude and the mental break, but for the past three months I've relied *heavily* on the *company* of RunKeeper.

   [APP IS A FRIEND, so long as the QSer kept working hard. No pain no gain.]
4. I even put Murray on RunKeeper so I could *tag* him on walks I took him on.

   [QSER'S FRIEND IS ALSO A QSER. This is one of the ways how the QS culture was activated and propagated through the infosphere's cognitive nonconscious.]

What's Next?

1. The quantification of my health has *allowed* me to take *control* of my health in ways I previously couldn't.

   [QUANTIFICATION IS KIND AND HELPFUL. After the successful weight loss, the QSer had a positive self-image. Before, it was negative.]

2. since I get daily *feedback* on my weight, body fat, and heart rate.

   [QSER IS A SMOOTH-RUNNING MACHINE. The apps helped improve the human as a machine.]

3. I've been able to *ween myself off* some of the measurement routine *without impacting* the results.

   [APPS ARE PARENTS. The QSer was like an infant who needed help three months before, but grew up quickly with the help of self-monitoring. The weight problem was no longer a forceful threat now.]

4. I've *developed* enough of a sense of "good foods" and "bad foods" that I trust myself not to have to take pictures of every bar code in my refrigerator anymore.

   [INTUITION IS AN ORGANISM. It grows. The apps provided assistance for growth, but they were also stressful, as the metaphors in the previous sections indicated.]

5. Eating what I normally eat and walking 12,000 steps a day generally helps me stay at an *even* weight.

   [WEIGHT IS BALANCE. The QSer's body has recovered balance, so did their mind. The weight was no longer an enemy now.]

6. This summer, I ate plenty of pizza and drank plenty of beer. I *had* lazy Sundays on the couch.

   [COMFORT IS POSSESSION. Compared with three months before when they had to conquer almost every day because they were in a battle, now they were more relaxed in mind, as they did not need to fight any more, but had won and and owned the days.]

7. However, some critical *tweaks* to my routine have *enabled* a *sustainable* lifestyle change.

   [QSER IS A FINE, FLEXIBLE, COMPETENT MACHINE. Now that the QSer was in a much more ideal physical state, they were also psychologically more positive than before, feeling capable.]

8. I'm now focusing on *reducing* my body fat percentage.

   [This is probably much less metaphorical than the expression used initially, *keep it off*. Hence no worries or invasion anymore, though the weight loss project went on.]

9. This winter may *have* fewer steps, but more burpees (*ugh*).

   [EXERCISES ARE CHALLENGING BUT DESIRABLE OBJECTS. Staying positive.]

By tracing the metaphors through the blog text and analysing their enactive source domain inferences, I have demonstrated how the use of metaphors has transformed dynamically alongside the changes in a QSer's reported physical states. At first, the QSer reported that they did not have an ideal body weight, and their use of metaphors revealed that, at least during the recall, they were threatened, stressful, effortful, like being in combat and being restricted. But they were also determined to win the fight, with the helpful QS devices. The quantification devices also gave them pressure to make fast progress. So after three months, the QSer claimed that they lost over 15 pounds. They were turned into a new, competent machine, being in control, in comfort and secure. Overall, the QSer's consciousness, cognitive nonconscious and the digital devices and environments together mutually shaped the dynamics of metaphor activation, transformation as well as the development of QSer's self-narrative.

3.3 Discussion and summary

Metaphors play a significant part in constructing the idealised roles the QSers play in the process of cultivating their new selves. They also facilitate the blend-in of new cognitive frames so that an increasing number of people are becoming identified with the movement and participating in self-tracking activities and show-and-tells. Although the metaphors are dispersed in different communication channels and modes, such as verbal, visual, auditory and tactile, they can be identified and regrouped systematically using a cognitively-informed critical discourse analysis methodology. However, the research I present in my thesis is just textual instead of multimodal, which will be interesting venues to explore in future work. Moreover, it is obvious that the methods I have chosen necessarily involve an analyst' subjective interpretations to various degrees, so it entails doing reflections by myself. Nonetheless, I argue that a methodic analysis of the QS discourse carried out in such a fashion is sound and valid, because it is theoretically informed and disciplined. If any other analyst comes to dispute with my analysis, they can always check the method(s) and point out where in which step or section they disagree. And we can agree to disagree.

In empirical science, one scientist's experiment necessarily awaits another's results to validate, applying the same universal and rigid conventions, such as the periodic table and metrological systems, as discussed in Section 2.2 above. Replicability is critical. However, I take a less positivist approach towards text analysis, and metaphor analysis in particular, for

social sciences and humanities, because of the background issue (Searle 1983) and indeterminacy nature of most metaphors' meanings (Ritchie 2006: 48)[33]. No two people hold the same background; the conventions in social sciences and humanities are always contested (or contestable) and negotiated, for example, the grammars. So even applying the same method to the same text, two interpreters can arrive at two different conclusions. Admittedly, the inter-rater reliability procedure offers some help and allows room for negotiation, but therein lies a further problem of mind shaping (Zawidzki 2008).

When two coders discuss and negotiate their metaphor identification results, for instance, they also shape each other's mind through their own implicit, habitual expectations and reactions to the other's linguistic and non-verbal behaviours. So it cannot be a completely objective process, and we may not even know what factors influence its objectivity. Thus, the problem with an additional inter-coder reliability test is twofold: First, it aims to eliminate uncertainties from a process where indeterminacy is the natural order of things. Second, aiming at this target, it uses a not-so-objective method.

When the French rationalist Descartes used radical scepticism to doubt everything except for the doubt itself, he demonstrated a high level of insecurity and a desire for extreme certainty. When we follow his steps to eliminate uncertainties from the natural order of things, we can easily fall into the trap of the excess of reason. On the contrary, the empiricists and cognitive scientists know, through experiments and probability theory, that both our social and natural worlds are fraught with randomness that cannot be avoided. Its common sense explanation is chance or luck.

As Foucault (1983a) forcefully argued, philosophers since Kant have taken on the role to 'prevent reason from going beyond the limits of what is given in experience; but from the same moment–that is, since the development of the modern state and the political management of society–the role of philosophy is also to keep watch over the excessive powers of political rationality. Which is a rather high expectation.'

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[33] 'As Vervaeke and Kennedy suggest, a novel metaphor 'may be interpreted very differently by different audiences' (1996, 283); I would suggest that most metaphors, including many of the most familiar, are subject to this indeterminacy (see Keysar and Bly, 1999). When a term such as 'attack', 'defend', or 'strategy' appears in a discussion of an argument, we cannot be sure whether any particular person will associate the term with chess, boxing, or all-out war – or with nothing beyond an abstract concept. How any particular speaker intends a metaphor to be interpreted, and how any particular hearer does interpret the metaphor, can never be absolutely determined. Knowing the communicative context helps, but even then, it is difficult to know which aspects of the context are salient to the hearer – or to the speaker.'

4. Data collection: Corpus-assisted identification of prototypical QS blogs

I needed to identify some representative, or prototypical QS blogs from my corpus to study. Therefore, this empirical chapter details the steps and measures I have taken to build a corpus of QS blogs and how to systematically identify the prototypical texts in the corpus.

4.1. Sampling methods

Since I made my argument based on linguistic evidence, I needed some representative, or prototypical, QS texts to analyse. This involved sampling methods.

4.1.1 Theoretical sampling

Generally, I used two kinds of sampling method for choosing the QS texts to analyse. First, I relied on theoretical sampling – a widely used sampling method for qualitative research, originated in grounded theory in ethnography – to collect the primary data on the Web for constructing a QS corpus. Since the emphasis of theoretical sampling was on conceptual development and saturation rather than data completion (Corbin, Strauss 2007, chapter 7) it allowed me to build the QS corpus through iterations, rather than completing it at once. Without having a hypothesis before analysing the data, each iteration would help develop and modify my model of what conceptual metaphors the QSers use in understanding their selves. The current chapter deals with the data collected in the first iteration.

4.1.2 Prototypical sampling

Second, to avoid cherry-picking and to be more systematic, I used a sampling method called 'prototypical sampling' based on keywords to choose a few representative texts from a corpus of QS blog entries. This sampling method was proposed by Anthony and Baker (2015), and reified in the corpus analytics ProtAnt. I used ProtAnt in my research to generate keywords lists for the entire corpus and identify prototypical QS blogs that contained the most keywords.

This sampling method was statistically rigorous and more quantitative and objective than theoretical sampling. Thus, I combined both qualitative and quantitative sampling methods in my study.

4.2 Corpus construction

Since there was no existing corpus of QS discourse, I have constructed one of my own to serve as a target corpus. In order to generate a meaningful keywords list, I also needed a larger, more general reference corpus, which I have also complied myself.

4.2.1 Target corpus

I have arbitrarily chosen a QS archive maintained by the California-based social enterprise QS Labs as the ground zero for my corpus construction. One of the reasons was QS Labs was a major campaigner of the QS movement. It organised offline QSer meetups and annual conferences in many parts of the world, and maintained a website quantifiedself.com that regularly gathered and disseminated QS-related information.

The QS archive, hosted on tinyletter.com, contained all of the What We're Reading (WWR) newsletters the organisation had sent out to its subscribers since 2014. In each issue of the WWR, there was a section called Show and Tell, which usually included the hyperlinks to two to three pieces of blog articles hosted on other websites, such as WordPress, Tumblr and Medium. The Show and Tell briefly summarised these blogs and let the readers explore further by themselves.

These blogs narrated the QSers' self-tracking experiences, methods and techniques from a first-person perspective, such as how to monitor sleep, control weight, avoid getting parking tickets, learn a new language and analyse music listening habits.

Here is some statistics on the archived QS blogs in 2014. Between its first issue in 23 May and 20 December, the WWR published 29 issues. After excluding broken links, non-blogs and duplicates in these issues, I have extracted 58 Show-and-Tell blog articles from them Among the 58 blogs, seven were published on blogging service websites, including WordPress, Tumblr and Medium; 38 were published on personal homepages using blogging service tools, including WordPress and Blogger. The rest were neither published on a dedicated blogging site nor on a personal homepage. They were published on company websites (such as software and communications companies' sites), social media platforms for sharing of documents and general information (instructables.com, reddit.com), media websites (thedailybeast.com, vox.com), a collective rather than individual blog (chrisspeed.net), a book promotion website (hackingtheimpossible.com) and a social movement campaign website (quantifiedself.com).

I copied these blogs from the Web and pasted them, respectively, into separate plain text files. After cleaning data noise in each text file, such as traces of markup language, blog metadata, hyperlinks, footnotes, references and programming code, I got 58 texts with a total of 69,926

words (calculated using MS Word). The lengths of individual texts varied between 269 and 4,112 words, and the median length was 990 words.

However, not all of the 58 blogs were qualified to be included in the target corpus. Three of them were on the topics of illness (such medical diseases as Type-1 diabetes, cystic fibrosis and Parkinson's disease), so they have been excluded. The remaining 55 are all on various lifestyle topics, including both work and leisure.

Furthermore, I have filtered out blogs by the same authors. The criteria was to keep only one blog by the author, which was closest to the median blog length. I also arbitrarily decided to cut the blogs whose lengths were under 500 words, in order to reduce the gap in number of words between the longest and shortest blog entries.

In the end, my final target corpus consists 40 unique blog entries, one blogger one blog article, in plain text format. The corpus size was 52,177 words. This size was not particularly large but workable, as this was only the first iteration of my data sampling, and I would be able to repeat the above process to collect the QS blogs in 2015 and 2016, if need be. Again, the focus here was not on data completion, but using small data through several iterations to quickly develop the conceptual model.

In comparison, the VU Amsterdam Metaphor Corpus (2016), 'the largest available corpus hand-annotated for all metaphorical language use' by collective effort, had about 190,000 lexical units, but it was not genre-specific.

The naming system of the text files in my target corpus was as follows, file number_QS newsletter issue number_blog's position in Show and Tell. For example, the prototypical text I had identified had the file name of 016_07_2, meaning that file no. 16 contained the second blog in the Show and Tell section in the seventh issue of QS newsletter.

4.2.2 Reference corpus

Only a target corpus was not enough for carrying out a corpus-assisted analysis of keywords, since comparing absolute word frequencies in a corpus is usually not (statistically) meaningful. To make meaningful comparisons, we have to know how a word's frequency in one corpus stands against the same word's frequency in another corpus, i.e. whether it appears more frequently or less frequently in corpus A than in corpus B. Therefore, I needed a much larger corpus of general contemporary English to serve as my reference corpus.

For this purpose, I have checked the Bank of English, Corpus of Contemporary American English (COCA) and Oxford English Corpus, but none of them was suitable, not only because they either had expensive paywalls or required applications and approvals to use, but also because none of them contained enough blog contents. I needed a reference corpus that included substantial blog contents in order to make my target and reference corpora comparable with respect to discourse type or genre.

Therefore, I decided to compile my own reference corpus. I have combined three openly available corpora which I downloaded from the Net to build my reference corpus. First, there was a Blog Authorship Corpus of over 140 million words, compiled by gathering posts of 19,320 bloggers on blogger.com in August 2004. The corpus incorporated a total of 681,288 posts and 144,200,489 words (estimated).[34] (Schler, Koppel, Argamon, Pennebaker, 2006) It was originally built for the purpose of studying gender and age effects on blogging. This blogger corpus was saved in xml format, and it took me some time to find a way to properly convert nearly 20,000 xml files in batch into plain texts (because ProtAnt only accepts files in txt format).

Second, I have downloaded the open portion of the American National Corpus (OANC) (first release), which, luckily, has txt files readily available. Excluding the spoken part, the written parts of the corpus together consisted of 11,406,155 words gathered discretely between 1990 and 2005 (this time of period was my estimation, because in the written OANC some sub-corpora were compiled without a gathering date) (American National Corpus Project 2016). This corpus did not contain any blog data.

Third, I used a 2009 version of Crown-CLOB corpus, which combined Crown and CLOB corpora using the Brown Corpus sampling frame. The 2009 Crown and CLOB corpora contained 1,026,226 and 1,023,466 tokens, respectively, so the total word count for the combined Crown-CLOB corpus was 2,049,692. The data were collected between 2008 and 2011, but the majority of them were dated in 2009. It did not have any blog data, either.

I also downloaded the British National Corpus (BNC), which was recently opened up for free download. However, it was coded in xml format and, after being converted into plain texts, it contains too many noisy HTML tags to be useful, unlike the blogger corpus, which contained

[34] I used AntConc to calculate its total size.

a limited amount of HTML tags after conversion. Also, the BNC was a relatively old (before 2000), so I did not incorporate it into my reference corpus.

As for the OANC, excluding the spoken part, the written parts of it together consisted of 11,406,155 words gathered discretely between 1990 and 2005 (http://www.anc.org/data/oanc/contents/).[35] The 2009 Crown and CLOB corpora contained 1,026,226 and 1,023,466 tokens, respectively, so the total word count for the combined Crown-CLOB corpus was 2,049,692. The data were collected between 2008 and 2011, but the majority of them were in 2009 (Xu and Liang 2013: 175–183).

In sum, my QS reference corpus included three sub-corpora with files all in plain text format. The total word count was 157,656,336, and 91.5 percent of the data were from blog posts. It included both American and British English sources, and, possibly, some other varieties of English in the blogger sub-corpora. I considered this reference corpus fit for my research purpose, because it was blog-skewed and big enough.[36]

In sum, my QS reference corpus included three sub-copora with files all in plain text format. The total word count was over 153,455,847 words, and over 90 percent of the data were blog posts. It included both American and British English sources, and, possibly, some other unidentified varieties of English in the blogger sub-copora. I considered this blog-skewed, written language reference corpus fit for my research purpose, because my target corpus was completely made up of blogs.

4.3 Identifying prototypical QS blogs using ProtAnt

PortAnt was a new prototypical text analysis tool first released in April 2015, and I was using its 1.2 version released in July 2016. According to Anthony and Baker (2015), prototypicality in corpus refers to having 'the characteristic features of the corpus as a whole.' In corpus linguistics, one of the widely accepted ways to describe a corpus characteristic features is using keywords.

> 'Keywords have been commonly used in corpus research as a way of identifying a salient set of lexis in one or more corpora, which can then be subject to more qualitative, interpretative analyses of collocates and concordance lines.' (ibid: 278)

35 This period is my estimation, because the written OANC contains some sub-corpora without a gathering date.

36 There is no criteria for the size of a reference corpus. However, a current general corpus is usually over 100 million words, e.g. the BNC had 100 million words (http://www.natcorp.ox.ac.uk/corpus/index.xml).

The software provided "a more principled way of selecting texts for close reading based on a ranking of texts in terms of the number of keywords (unusually frequent words in the target corpus compared with a reference corpus) they contain" (ibid: 274).

It thus required an analyst to import their own target and reference corpora in plain text format for word-by-word comparisons. After the comparisons, the software 'generates a ranked list of keywords based on statistical significance and effect size, and then orders the texts [in the target corpus] by the number of keywords in them' (ibid: 274). Thus, I used ProtAnt in my research to generate a keywords list for the entire QS corpus and identified a prototypical QS blog that contained the largest number of keywords.

My ProtAnt parameters were as follows, keyness: log likelihood (4-term), p-value: 0.05, effect size measure: %Diff, normalisation frequency: 500 words, ignore case ticked. The %Diff method indicated "the proportion (%) of the difference between the normalised frequencies of a word in two corpora" (http://ucrel.lancs.ac.uk/ll/DIFF_FAQ.pdf).

In particular, Anthony and Baker (2015 July) said, 'Texts containing high numbers of key words are those that contain more words that characterize the corpus as a whole and thus can be considered to be prototypical of the corpus as a whole.'

By identifying the prototypical blog texts, I could reduce the amount of my analytical work to a manageable level by reading a few number of blog articles that could represent the whole corpus. Meanwhile, relying on statistically rigorously generated keywords, ProtAnt also identifies the outlier texts, which contain very few keywords, or not at all.

4.3.1 Keywords generation

As mentioned above, keywords served as the key to unlock prototypical texts in a corpus, and, specifically, in ProtAnt, keywords meant those words appearing more frequently in the target corpus than in the reference corpus.

There were a few statistical methods for measuring the 'keyness' of keywords. A preferred method was log likelihood (LL), because it did not presuppose a normal distribution of words in natural language (McEnery, Hardie 2012: 51-52; Dunning 1993). However, some corpus linguists recently have argued that LL was still not good enough, because it only measured confidence level of a difference (corresponding to p-value), but not how large the difference was. To measure the size of the difference, corpus experts have recommended measuring the effect size of keywords. In other words, it was not enough to know with a certain level of

confidence that a word in corpus A was overused compared to corpus B, but also we needed to know, or measure, how much the overusage was. For example, a word with high LL value and small effect size could mean that we could be highly confident that there was a small frequency difference of 'data' between the target and reference corpora (Gabrielatos, Marchi, 2012). In a personal correspondence with Anthony on 1 June 2016, he also advised using an effect size measurement against p-value,

> 'You should never rank by p-value. Instead, you should be using an effect size measure such as Log Ratio (included in ProtAnt) to reduce the number of words you use in your analysis.' (Anthony, personal correspondence)

Since I chose to rank the keywords by %Diff values rather than LL values, I did not need to set a too conservative p-value. Also, the smaller the p-value, the fewer keywords ProtAnt will generate. In my case, this risks omitting the words that had large effect sizes but low LL values.

For example, if I set p-value at 0.0001, everything else remaining the same as the above, then I got a list of 671 keywords. If I set p-avlue at 0.00001, everything else being equal, then I got 451 keywords. Some keywords disappeared in the second list not because they had a smaller effect size, but because their confidence levels were lower than those of some other words with the same effect size. For instance, in the former list (p-value=0.0001), *sensoria* had LL: 27.7852424785, %Diff: 539629.142643, while *spotify* had LL:15.8017724956, %Diff: 539629.142643. In the latter list (p-value=0.00001), *spotify* was omitted. Obviously, it was because *spotify*'s LL value was smaller, despite the fact that both keywords' effect size values were the same and considerable.

In this case, it was problematic to omit *spotify* from the keywords list, because first, it had a very large effect size, meaning there was a considerable difference in usage, and second, its LL value was lower but not insignificant. According to the University Centre for Computer Corpus Research on Language (UCREL) at Lancaster University (http://ucrel.lancs.ac.uk/llwizard.html), a p-value of 0.0001 corresponds to a critical LL value of 15.13, and *spotify*'s LL value of 15.8017724956 was larger than this, signifying that we could be more than 99.99 percent sure that there was a difference.

For this reason, I opted for controlling the p-value at 0.05, that is, I only needed to be reasonably confident, but not extremely so. Then I selected four different cut-off thresholds

for the keywords list, namely, the top 100, 200, 400 and 800 words. When I set the threshold at -1 in ProtAnt, it would give me a full list of keywords. In this case, it yielded a complete list of 1,983 keywords measured by %Diff.

This means that, essentially, I had only one keywords list, but four different versions with varying cut-off points on the list. This was different from changing the p-value in order to change the lengths of keywords list, because once the p-value was changed, a new list containing a different set of keywords got produced.

4.3.2 Identifying prototypical QS blogs

Each time I run the ProtAnt, it produces at the same time a keywords list, a list of ranked texts (by normalised key types and normalised key tokens) based on how many keywords from the list each of them contains, and a list of all the texts with their respective keywords. (For example, see Table 1 for ranked texts by normalized key types based on top 100 keywords list)

File	NormKeyTypes	NormKeyTokens
016_07_2.txt	12.1	23
022_10_3.txt	10.8	7.6
050_23_3.txt	8.9	16.9
005_02_3.txt	8.7	3.9
056_28_1.txt	8.5	16.4
057_29_1.txt	8.2	4.7
008_03_3.txt	6.9	11.5
033_17_1.txt	6.8	22.1
021_10_2.txt	6.3	2.5
012_05_2.txt	6.3	10.4
001_01_1.txt	5.4	3.1
043_21_3.txt	4.7	4.4
002_01_2.txt	4	3.7
011_05_1.txt	3.7	3.5

TABLE 1: PART OF RANKED TEXTS BY NORMALIZED KEY TYPES BASED ON TOP 100 KEYWORDS LIST

So when I had four lists of top 100, 200, 400 and 800 keywords in target corpus measured by %Diff, I also had, in the meantime, four lists of ranked texts (from the most typical to the least) based on their respective keywords list. Putting these four lists of ranked texts together

in a table and compare, I have identified a group of texts that are most typical of the corpus (Table 2) as well as some outliers (Table 3).

	0.05 (top 100)		0.05 (top 200)		0.05 (top 400)		0.05 (top 800)	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
1	016_07_2	016_07_2	057_29_1	033_17_1	022_10_3	016_07_2	016_07_2	016_07_2
2	022_10_3	033_17_1	008_03_3	016_07_2	016_07_2	022_10_3	022_10_3	043_21_3
3	050_23_3	050_23_3	022_10_3	056_28_1	012_05_2	033_17_1	043_21_3	055_27_1
4	005_02_3	056_28_1	016_07_2	050_23_3	047_22_4	050_23_3	012_05_2	012_05_2
5	056_28_1	003_02_1	047_22_4	008_03_3	057_29_1	055_27_1	056_28_1	056_28_1
6	057_29_1	008_03_3	033_17_1	003_02_1	005_02_3	056_28_1	033_17_1	022_10_3
7	008_03_3	012_05_2	050_23_3	055_27_1	055_27_1	047_22_4	055_27_1	050_23_3
8	033_17_1	055_27_1	005_02_3	043_21_3	008_03_3	012_05_2	057_29_1	033_17_1
9	012_05_2	022_10_3	056_28_1	047_22_4	033_17_1	029_14_3	050_23_3	006_03_1
10	021_10_2	019_09_2	011_05_1	012_05_2	043_21_3	043_21_3	005_02_3	028_14_2
11	001_01_1	028_14_2	012_05_2	022_10_3	050_23_3	005_02_3	006_03_1	003_02_1
12	043_21_3	057_29_1	055_27_1	006_03_1	056_28_1	008_03_3	047_22_4	029_14_3
13	002_01_2	043_21_3	001_01_1	057_29_1	001_01_1	003_02_1	053_24_3	051_24_1
14	011_05_1	005_02_3	021_10_2	011_05_1	011_05_1	001_01_1	032_16_2	021_10_2
15	024_11_2	002_01_2	043_21_3	019_09_2	029_14_3	006_03_1	001_01_1	047_22_4
16	053_24_3	011_05_1	029_14_3	028_14_2	021_10_2	057_29_1	029_14_3	032_16_2

TABLE 2: COMPARISONS OF FOUR LISTS OF RANKED TEXTS FOR IDENTIFYING PROTOTYPICAL TEXTS

	0.05 (top 100)		0.05 (top 200)		0.05 (top 400)		0.05 (top 800)	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
25	019_09_2	006_03_1	032_16_2	024_11_2	018_09_1	032_16_2	051_24_1	019_09_2
26	014_06_1	029_14_3	042_21_2	044_22_1	003_02_1	007_03_2	004_02_2	053_24_3
27	028_14_2	014_06_1	014_06_1	032_16_2	028_14_2	004_02_2	049_23_2	018_09_1
28	044_22_1	007_03_2	004_02_2	014_06_1	051_24_1	053_24_3	031_16_1	024_11_2
29	007_03_2	042_21_2	037_19_1	031_16_1	048_23_1	048_23_1	024_11_2	007_03_2
30	006_03_1	044_22_1	051_24_1	004_02_2	024_11_2	051_24_1	048_23_1	039_20_1
31	031_16_1	037_19_1	007_03_2	037_19_1	014_06_1	044_22_1	039_20_1	004_02_2
32	048_23_1	031_16_1	031_16_1	041_21_1	019_09_2	024_11_2	042_21_2	031_16_1
33	037_19_1	048_23_1	041_21_1	007_03_2	007_03_2	014_06_1	007_03_2	048_23_1
34	051_24_1	051_24_1	019_09_2	042_21_2	049_23_2	031_16_1	019_09_2	014_06_1
35	004_02_2	004_02_2	028_14_2	051_24_1	031_16_1	049_23_2	014_06_1	037_19_1
36	023_11_1	023_11_1	039_20_1	049_23_2	042_21_2	042_21_2	044_22_1	023_11_1
37	027_14_1	027_14_1	048_23_1	039_20_1	037_19_1	037_19_1	037_19_1	042_21_2
38	032_16_2	032_16_2	049_23_2	048_23_1	023_11_1	041_21_1	023_11_1	027_14_1
39	039_20_1	039_20_1	023_11_1	023_11_1	041_21_1	023_11_1	027_14_1	044_22_1
40	049_23_2	049_23_2	027_14_1	027_14_1	027_14_1	027_14_1	041_21_1	041_21_1

TABLE 3: COMPARISONS OF FOUR LISTS OF RANKED TEXTS FOR IDENTIFYING OUTLIER TEXTS

Specifically, I have counted in the top 5 range of Table 2 which texts appeared twice or more in the matrix. It turned out that there were eleven such texts, whose file names were 008_03_3, 012_05_2, 016_07_2, 022_10_3, 033_17_1, 043_21_3, 047_22_4, 050_23_3, 055_27_1, 056_28_1 and 057_29_1. Also, within the top 5 range, file 016_07_2 appeared eight times, the most, followed by 022_10_3 (five times), 056_28_1 (five times), 050_23_3 (four times), 012_05_2 (three times) and 033_17_1 (three times). Of the rest, each appeared up there twice.

By the same measure, I have identified the outliers appearing twice or more in the bottom 5 range. These outlier texts were files 023_11_1, 027_14_1, 032_16_2, 037_19_1, 039_20_1, 041_21_1, 042_21_2, 044_22_1, 048_23_1 and 049_23_2, subtotalling ten blogs. Among the outliers, 023_11_1 and 027_14_1 both showed up in the bottom 5 matrix eight times, while 039_20_1, 041_21_1 and 049_23_2 showed up four times each.

4.3.3 Keywords in prototypical texts group

Having identified the prototypical texts, I went on to discover which keywords they contained as a group, drawing on the list of files with their respective keywords produced by ProtAnt. I have found that this prototypical texts group altogether contained 61 keywords from the top 100 keywords, compared with merely seven keywords in the outlier texts group. (C.f. Appendix for the top 100 keywords) This should be obvious, because prototypical texts in ProtAnt are by definition those that have the higher number of keywords.

I have further analysed the composition of the 61 keywords in the prototypical group, and the results showed that 33 of them, or over half, were brand names, including brands of consumer products (apps, hardware and services), such as *beeminder*, *fitbit* and *echonest*, trademarks of consumer and office products, such as *tessel* and *splunk*, and a business service brand, *twilio*.

In addition, there were 12 jargons related to statistical, biomedical and computer knowledge (such as *grs*, *hrv*, *raspi* and *rmssd*) and 11 coinages (mostly used for computer programming, and an Internet slang, *scrobbling*).

4.4 Discussion

It is both surprising and interesting to find out that the QSers use so many brand names in the prototypical blogs. It is perhaps more apparent and easier to understand why the blogs

contain many computer and biomedical terms, because quite a few of the self-trackers are programmers and they pay attention to their vital signs with the help of QS gadgets. But why do brand names figure so prominently here ?

What's in a name ? That which we call a Fitbit would by any other name track us as closely, be it called MyFitnessPal, RunKeeper or Beddit.

As mentioned in the beginning of this chapter, QS devices are mostly made from global positioning devices, gyroscopes, altimeters and accelerometers, or a combination thereof. So why do the QSers not call their devices as what they are, or use a more generic name, such as a sensor, a tracker, or a pedometer with wireless connection, to refer to those products ?

As aforementioned, the evidence showed that many of the brands are of consumer products, and even if some products are not strictly for consumption (for example, splunk is usually a data analytical service for companies, not for individuals), they have still been re-appropriated for consumer use in a home or lifestyle context. The mixture of consumer and business trademarks in QS discourse may signify a proliferation of technologies from the industry into everyday life. It is, therefore, arguable that the QS movement is connected to consumerism and consumerist understanding of wellbeing.

In fact, this is not novel and it corroborates with some previous findings by sociologists on alternative therapies and wellbeing as well as on QS.

A critical study of selected British newspaper reports on the shifting notions of wellbeing from 1985 to 2003 indicated, 'Whereas wellbeing tended to be a term utilised in relation to the body politic in the mid-1980s, wellbeing has now emerged as a significant attribute being sought through a variety of personal wellbeing practices that often have a consumerist character.' (Sointu, 2005) In other words, whereas (a nation's) 'economic wellbeing' was a more probable collocate in the news discourse in the mid-1980s, the term wellbeing became increasingly associated with personal health and choosing consumers from the late 1980s and early 1990s onward.

Moreover, Lupton (2013: 27-28) pointed out about the QS,

'[W]hen notions of health, wellbeing, and productivity are produced via data drawn from self-monitoring, the social determinants of these attributes are hidden. Illness, emotional distress, lack of happiness, or lack of "productivity" in the workplace become represented primarily as failures of individual self-control or efficiency, and therefore as requiring greater

or more effective efforts, including perhaps increased intensity of self-tracking regimens, to produce a "better self."

The quantified self approach may therefore be viewed as one of many heterogeneous strategies and discourses that position the neoliberal self as a responsible citizen, willing and able to take care of her or his self-interest and welfare. Foucault's writings on the practices and technologies of the self in neoliberalism are pertinent to understanding the quantified self as a particular mode of governing the self.'

Therefore, in terms of wellbeing, the QS practice is in line with a 'personal turn' since the late 1980s and early 1990s, when the responsibility of taking care of the individuals was shifted from the state to the consumerist self, and when the interrelated notions of self-responsibility, self-reflexivity and self-control became established as key frames of reference behind the mainstream discourse on wellbeing.

In this connection, the QS gadgets and apps are considered, to use a Foucauldian term (Foucault, 1988), as new technologies of the self, which the self-trackers use to monitor and reflect on their everyday life experiences in order to gain more self-knowledge for the purpose of improving self-discipline and self-control.

4.5 Summary

In this chapter, I have demonstrated how to use a corpus-assisted approach to systematically find out the prototypical QS blogs, combining qualitative and quantitative methods. Particularly, I showed how to use ProtAnt, a novel prototypical text analysis tool to generate keywords lists and use them as basis for deeper analyses.

Although some researchers such as Mittelstadt (2013) have already studied lifestyle monitoring with mobile devices in a health or clinical context for diagnosis purposes, not enough study has been done on the devices' applications outside of the clinical environment, not on their uses for life-optimisation or life-management purposes.

Therefore, from an applied linguistics perspective, I believe the language of QS, or self-tracking for life management, is worth more analyses, because, first, it is a very recent form of discourse, appearing around 2007 with the start of QS movement in the US and is still developing, exhibiting a novel way of discussing the (idealised) self through statistical frame (the QS movement's slogan is 'self-knowledge through numbers'). The use of statistical frame as a rhetorical device in QS also coincides with similar contemporary developments in

the popular discourse of economics (e.g. Freakonomics), behavioural psychology (e.g. Thinking, Fast and Slow), politics (e.g. Nate Silver's blog FiveThirtyEight), sports (e.g. Moneyball) and 'big data.' (Butterworth, 2014)

Second, from a cognitive linguistics point of view, studying the conceptual metaphors in relation to the ideal of wellbeing in QS discourse can throw light on the QSers' understanding of their experiences and perceptions of life in 'infosphere,' a space increasingly shaped by information and communications technology (ICT) as infrastructure, where its inhabitants' life is always on, always connected, according to information philosopher Floridi (2014, chapter 2).

This is exemplified by the fact that many QS bracelets are designed with and promoted for the features of sleep monitoring and water-proofing, so that the users will never have to take them off to take a shower and are encouraged to keep them on when sleeping. As some surveillance scholars put it, the QSers voluntarily live in constant self-surveillance (Best, 2010).

In this regard, studying the conceptual metaphors related to wellbeing in QS discourse promises to contribute to our better understanding of life in such a space.

Therefore, the next empirical chapter will identify and analyse the conceptual metaphors in the most prototypical QS blog in my corpus.

5. Finding systematicity of metaphors in prototypical QS blog

5.1 Introduction

In the previous chapter, I have identified several prototypical texts in the corpus of QS blogs, so now I am going to thoroughly analyse the most prototypical one, namely, file 016_07_2. It is the second Show and Tell blog included in the seventh issue of What We're Reading newsletters. During the prototypicality sampling in the previous chapter, it ranked in the top 5 range eight out of eight times. The highest record of other more prototypical blogs was only four out of eight times in the top 5 ranking. As a result, file 016_07_2 has been chosen for a detailed analysis of its metaphors.

5.2 QS metaphor identification and systematic metaphor analysis

The QS blog entry 016_07_2 was 629 words long, and its title and subtitle were Using Self Monitoring and Data: A Summary of My Quest to Use Self Monitoring and Technology to Get Healthy. It was hosted on blogspot.com, dated Tuesday, December 17, 2013. Its section headings were, consecutively, Hardware and Beginning Tracking, Refining Tracking and Exploring Data Analysis and Visualization, Another Hardware Update, Pulling it Together and Data Integration and Analysis. The blogger's byline was omitted. Its style was typical of asynchronous written CMD, as it had many of the features close to formal writing, but also omitted the subjects in several sentences, omitted punctuation marks in a few places, had a couple of typos (such as *presssure* and *coulple*), and did not have a conclusive ending.

I used two methods for identifying the metaphors in it. First, I used the "Metaphor Identification Procedure" (MIP) developed by the Pragglejaz Group (2007: 1-39) to brush through the entire text word by word, in order to determine which lexical units were used metaphorically. Second, I used an approach recently proposed by Cameron et al (2010) to extract a special kind of metaphor clusters, called systematic metaphors, from the linguistic metaphors that had been identified using the MIP. This approach was also used by Deignan et al (2013: 9) for several case studies of figurative language in a recent book.

Below, I will detail consecutively how I have applied the MIP and "systematic metaphor analysis" (SMA) to the identification of linguistic and conceptual metaphors in blog 016_07_2. I have to note beforehand, though, that the SMA developed beyond the CMT, as it recognised that linguistic metaphors could be motivated by the conceptual metaphors, but there were also many other ways from which the linguistic metaphors came into use,

including conventionalisation. Meanwhile, not every condition for prompting the metaphor use was knowable from discourse data. (see Cameron 2010: 85-88) So Cameron (online) proposed that "[a] linguistic metaphor… is a stretch of language that has the *potential* to be interpreted metaphorically" (emphasis is mine). Moreover, if language and culture can be considered in terms of complex dynamic systems, then metaphors "are not 'owned' by the individuals who produce them, but are 'interindividual', belonging to both speaker and listener" (Morson and Emerson 1990: 129 quoted after Cameron online) and "intrinsically connected to the specific context of use." (ibid)

So in my case, I was not arguing that the linguistic metaphors I identified were necessarily processed metaphorically by the blogger (he might as well not). My arguments about the metaphoricity of those words and phrases in the blog were largely based on my identification method, interpretation according to the blog's co-text and my understanding of the QS culture (informed by my attendance at several QS meetups in the UK, watching their show-and-tell videos online, reading their blogs, meeting the QS Labs people in the US, reading the QS literature, including the sociological accounts, media commentaries and a dystopian novel, The Circle by Dave Eggers, etc.). Since I was taking a "maximal approach" set forth by the Pragglejaz Group (2007: 2), I might have identified more metaphors than the blogger would have processed in his mind.

With the help of Word software, I converted the blog file 016_07_2 from a string of words into a comma separated values (CSV) file. Opening the CSV file in Excel gave me a list of each and every word in the 629 words document. First, I decided if a word or a collocation constitutes a lexical unit. Following the Pragglejaz Group's maximal principle, I determined that most lexical units were made up of single words. Second, I determined the basic meaning of each lexical unit,[37] using a corpus-based learners' dictionary tool oxfordlearnersdictionaries.com and a corpus-based contemporary English dictionary tool en.oxforddictionaries.com. Both Pragglejaz (2007: 15, 17-18) and Deignan (2015: 151-154) argued for the use of a learner's dictionary and taking a corpus approach.[38] Third, I

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[37] A basic contemporary meaning was defined by the Pragglejaz (2007: 3) as "—More concrete [what they evoke is easier to imagine, see, hear, feel, smell, and taste]; —Related to bodily action; —More precise (as opposed to vague); —Historically older; Basic meanings are not necessarily the most frequent meanings of the lexical unit."

[38] Deviating somehow from the Pragglejaz, I used an online contemporary English dictionary in addition to a learner's dictionary, because the learner's dictionary sometimes did not have a definition that was "basic."

determined the lexical units' contextual meanings based on my own reading of the blog and understanding. Fourth, I compared the contextual meaning with the basic meaning, and judged if the contextual meaning could be considered as being derived from the basic meaning. If yes, then the lexical unit was tagged as "metaphorically used." For instance, in a sentence from the blog,

(1) my blood pressure was elevated

the metaphoricity of lexical unit elevated was thus determined (Table 4),

Lexical unit	Contextual meaning	Basic meaning	Contextual meaning vs basic meaning	Metaphorically used ?
elevated.	The level of blood pressure was increased.	Higher than the area around; above the level of the ground	An increase in blood pressure is going up. INCREASE IS UP.	YES

TABLE 4: DETERMINING METAPHORICITY OF A LEXICAL UNIT USING MIP

There were a few exceptions that were excluded from the metaphor tagging. The preposition *to*, used after a verb to signal purpose or intention, is metaphorical in a CMT sense (GOAL IS DESTINATION), but was arbitrarily omitted from consideration because its such usage was too common. When it was not used after a verb, however, its metaphoricity was pondered. The articles or determiners, *a*, *an* and *the,* were not taken into account, either. Neither were conjunctions. The modal verb *can* was considered for it signalled human agency and volition, and, when coupled with an object in the subject position, could constitute personification. There were many instances of personification of the QS gadgets and services in the text. Besides, abbreviations were not considered for their metaphoricity, even if they were metaphorical in the first place when they were invented and unabbreviated.

I was the only analyst in this QS metaphor identification, so no inter-rater reliability test was carried out. However, two measures were made to enhance reliability. First, I consulted both of the online dictionaries for checking the basic meaning of every word. Second, I carried out two passes of the analysis, leaving some of the uncertain cases as they were during the first pass, rather than rushing to make a judgement. On the following day, I reviewed the results,

made my judgements and completed all the tagging. The final results of the MIP applied to blog file 016_07_2 can be found in Section 5.

After finding out all of the 166 metaphorically used lexical units in the blog text, I went on to analyse the systematicity in these metaphorical units, or linguistic metaphors. "A systematic metaphor is not a single metaphor but an emergent grouping of closely connected metaphors" (Cameron 2010: 91) It is different from a conceptual metaphor in three ways that it puts language as prior to thought, individuals as prior to speech communities, and the specific as prior to the more general. But systematic metaphors share with conceptual metaphors the idea that connected patterns of metaphors are "important tools in understanding and talking or writing" (see ibid: 91).

In order to differentiate itself from conceptual metaphor analysis (CMA), SMA uses such labels as vehicle and topic, similar but not equivalent to target and source domains in CMA. Also, in SMA, the metaphors are written in *SMALL ITALIC CAPITALS*, instead of SMALL CAPITALS used in CMA. (Cameron et al 2010: 116-118)

Carrying out an SMA on the QS blog involved four steps: first, I identified the vehicle of each metaphorical unit by referring to its basic meaning identified during the MIP. The entire blog was also divided into 73 lines, largely based on clauses, so I knew a unit appeared in which clause or context. This helped me better determine the vehicles. Second, after labelling all the vehicles, I collected the metaphorical units belonging to the same vehicle groups together, respectively. Third, based on my reading of the blog and its staging, I identified five key discourse topics, or main themes, of the blog article. I then marked down which metaphorical unit belonged to which topic or sub-topic. Fourth, I re-organised the vehicles labelled in the second step under their corresponding topic groups, respectively, so the systematic metaphors were derived. Then I pulled the same systematic metaphors together in a list, which will be presented in Section 5.

With regard to the third step above, I identified and coded the following five key discourse topics:

1. The QSer's own health conditions, including blood pressure, weight, sleep, etc
2. QS devices and services, or QS tools (2T), used to track the body (and activity) data (2D), including blood pressure, diet, weight, sleep, steps or activity
3. How the tools are used for self-tracking

4. How the body data are processed with the tools, including integration, analysis and visualisation
5. Other topics outside the blog's main areas of interest, such as seeing a doctor and the blogger's ideas and thoughts

These topics were resulted from the fact that the blogger had divided his article into five sections, namely Hardware and Beginning Tracking, Refining Tracking and Exploring Data Analysis and Visualization, Another Hardware Update, Pulling it Together and Data Integration and Analysis. In addition to this staging information, my research interest on the QSers, their self-tracking tools and methods and how they process and deal with their body data also helped me come up with the six topical categories (including two sub-categories in Topic 2).

5.3 QS metaphor results

Following the MIP, I determined 596 lexical units out of 629 words in the QS blog 016_07_2, and 166 of the lexical units were judged as metaphorically used, or 27.9 percent. In comparison, in an analysis of a newspaper article of 676 words using the same method, Pragglejaz (2007: 18) identified that 24.6 percent of the lexical units were metaphorically used.

There were also many cases of metonymy and synecdoche, such as using a brand name of QS device to stand in for the device itself and using a bodily activity to refer to the data generated by the activity. Although interesting, they will be discussed in another essay.

Based on the above results of MIP, I carried out further systematicity analysis. First, I present below the vehicle groupings of the SMA (Table 5).

Vehicle grouping	Metaphor units collected into the grouping
ANSWER	key
CALCULATE	figured
COMBINATION	integration
COMBINE	integrate
CONTACT	on
CONTAINER	into, in, out, within
CONTROL	managed
DIRECTION	back, from, for, to, into

Vehicle grouping	Metaphor units collected into the grouping
DISCOVERY	analysis, exploring, figured, key, lose, quest
DIVISION	analysis
DOCUMENT	reports, charts
FOLLOW	tracking, track, tracks
GEOGRAPHY	trends
LINES	network
LOCATION	in, on, by, further, around, over, out, within
LOSE/FIND	lose
MONEY	invested, account, wealth
PATH	from
PHYSICAL ACTION	gathering dust, start, started, exporting, run, pulling it together, offers, makes, produce, pull, pulls, sync, measures, use, updates, update, get, gets, got, based, does. set up, set this up, settled
PLACE	site, sites
POSSESSION	my, keep, have, share
POWER	can, able
PREPARE	set up, set this up
PRODUCTION	quality, projects
PROJECT	projects
RATIONALITY	reasonably
RECEIVE	got
RELATION	friends
REMOVE	refining
REST	settled
ROUTE	course, way
SEARCH	quest
SEE/SEEING	saw, reviewed, resolved, visualization, visualize, visualizations, watch
SPEAK	explains
TEACHING	tutorial

Vehicle grouping	Metaphor units collected into the grouping
TRAVELLING	exploring
UP	elevated
VOLITION	allows, allow, allows for, with
WATER	sources
WRITING	logging, logs, log, records
WRITTEN TEXT	script

TABLE 5: METAPHOR VEHICLE GROUPINGS ACCORDING TO SMA

Then I connected these vehicles to the topics in an Excel sheet, containing the topics, metaphors, and their respective lines (see Table 6).

Topic	Metaphor	Line	File	Clause	
	HEALTH CONDITIONS ARE PRODUCTS				
1	quality	58	016_07_2	FitBit with a [coulple] of clicks tracks my sleep duration, quality	
	BODY DATA ARE WRITTEN TEXTS				
2D	logging	21	016_07_2	and I resolved to start logging steps.	
2D	logging	31	016_07_2	I'm logging my steps and weight on WalkerTracker and MyFitnessPal.	
2D	logging	32	016_07_2	Logging my diet on MyFitnessPal.	
2D	logging	35	016_07_2	Was manually logging data on multiple sites	
2D	log	55	016_07_2	I log my diet on MyFitnessPal	
2D	log	56	016_07_2	I log my blood presssure on FitBit	
2D	records	46	016_07_2	The FitBitOne records steps, very active minutes, floors climbed, dista	

TABLE 6: GATHERING TOGETHER TOPICS, VEHICLES AND METAPHORS USING SMA

By comparing and connecting the topics and vehicles, I further put them together in a summarised list (see below), without the linguistic metaphors and their co-texts as seen in Table 6, thus systematically mapping out which systematic metaphor vehicles were used by the blogger in his discussion of each topic. There were in sum six topical categories, each containing a various number of vehicles.

I *HEALTH CONDITIONS*

A *ARE OBJECTS*

(THAT CAN BE POSSESSED)

(THAT CAN BE FOUND OR LOST)

(THAT CAN BE KEPT IN A PLACE)

B HAVE DIRECTIONS (SPATIAL AND TEMPORAL)

C *ARE WILD BEASTS THAT ARE HARD TO CONTROL*

D *ARE PUZZLES*

E *ARE MOVING OBJECTS*

F *ARE PRODUCTS*

II *QS TOOLS*

A ARE DESTINATIONS

B *ARE OBJECTS*

C *ARE VISIBLE OBJECTS*

D *ARE OBJECTS OF RATIONALITY*

E *ARE OBJECTS (THAT CAN BE POSSESSED)*

F *ARE PLACES*

G *ARE SOCIAL PLACES*

H *ARE PEOPLE*

I *ARE WORKERS*

J *ARE INTELLIGENT*

K *HAVE POWER AND VOLITION*

L *CAN BE CONTROLLED*

M *SEND SIGNALS OVER LINES*

N *ARE CONTAINERS (OF VALUABLE THINGS)*

III *BODY DATA*

A *ARE WRITTEN TEXTS*

B *ARE MOVING OBJECTS*

C *ARE OBJECTS*

D *ARE OBJECTS (THAT CAN BE POSSESSED)*

E *ARE OBJECTS (THAT CAN BE MOVED IN DIRECTIONS)*

F *ARE WATER*

G *ARE GEOGRAPHICAL AREAS*

H *ARE MONEY*

I *ARE NUMBERS*

IV *USING QS TOOLS*

A *IS FOLLOWING*

B *IS SEARCHING*

C *IS A JOURNEY*

D *IS AN OBJECT THAT NEEDS PURIFICATION*

E *IS SEEING*

V *PROCESSING BODY DATA*

A *INVOLVES DIVISION AND COMBINATION*

B *INVOLVES SEEING*

C *IS A JOURNEY*

VI Other topics:

A *MAKING A DECISION IS SEEING*

B *VISITING IS SEEING*

C *SERVICES CAN BE POSSESSED*

D *IDEAS ARE OBJECTS*

E *THINKING IS CALCULATION*

F *BODY IS A CONTAINER*

G *METHOD IS AN OBJECT*

H *INFOSPHERE IS THE SAME AS ANTHROPOSPHERE*

I *DIGITAL PRESENTATIONS ARE PEOPLE*

J *ENERGY IS AN OBJECT*

5.3 Discussion

I have presented in Section 5.2 the linguistic and systematic metaphors that I found in the QS blog 016_07_2. However, their significance needed further examination, especially with regard to the conceptual frames the QSer used for the concepts of *self* and *data.* So in Section 5, I discuss what the data meant by presenting three interesting "metaphor trajectories" in his thought,[39] or thought patterns, that I traced through connecting the linguistic metaphors, using the systematic metaphors as guidance.

The first trajectory was about the QSer's self, or more specially, an aspect of his self, his health. The QSer conceptualised that his *HEALTH CONDITIONS ARE OBJECTS*, which was a framing probably influenced by his primary care physician, who told him many times to "lose weight." E.g.

[39] See Cameron et al 2009: 7ff

(2) His advice (previously stated, as well) was, "Lose Weight." (7)[40]

(3) I log my blood [presssure] on FitBit (56)

Of course, it might also be conventional to think of health as an object. It was consistent with the CMT's finding that people think of abstract ideas in concrete terms, or ABSTRACT IS CONCRETE, so that they can be grasped, manipulated or controlled.

Nevertheless, early in the article, the blogger stated that his experience was that his health conditions were not so controllable, and sometimes puzzled him.

(4) I'd managed to keep my weight in control (9)

(HEALTH CONDITIONS ARE WILD BEASTS)

(5) *I realized self monitoring was key.*[41] (10)

(HEALTH CONDITIONS ARE PUZZLES)

Therefore, the blogger used the help of self-monitoring devices and services and went on a journey of discovering the secret to good health. The related systematic metaphors here were *USING QS TOOLS IS A JOURNEY* and *IS SEARCHING* and *PROCESSING BODY DATA INVOLVES SEEING.* There was also in line with the CMT metaphors, LIFE IS A JOURNEY, GOALS ARE DESTINATIONS and KNOWING IS SEEING. E.g.

(6) A Summary of My Quest to Use Self Monitoring and Technology to Get Healthy (2)

(7) I also started tracking my diet, daily steps, and weight on MyFitnessPal. (25)

(8) Did not have an easy way to integrate and visualize the data (36)

And since this journey was not easy, it required effort, as the systematic metaphor indicated *USING QS TOOLS IS AN OBJECT THAT NEEDS PURIFICATION.*

(9) Refining Tracking and Exploring Data Analysis and Visualization (29)

There were also frames related to production (in an office, factory, building site and etc) or productivity, which again suggested that his self-tracking was not for leisure and that good health required work and effort to get. For instance, his sleep was regarded as a product having "quality," in contrast to, alternatively and perhaps more commonly, being considered as relaxation.

(10) These sites all produce some reports and charts. (33)

(*QS TOOLS ARE WORKERS*)

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[40] Numbers in the brackets are line numbers in the blog.

[41] That is, key to understanding their health.

(11) The FitBitOne records steps, very active minutes, floors climbed, distance and even sleep. (46)

(*BODY DATA ARE WRITTEN TEXTS*)

(12) I log my diet on MyFitnessPal (55)

(*BODY DATA ARE WRITTEN TEXTS*)

(13) FitBit with a [coulple] of clicks tracks my sleep duration, quality (58)

(*HEALTH CONDITIONS ARE PRODUCTS)*

(14) I can set up charts within the spreadsheet that automatically update. (69)

(*QS TOOLS ARE WORKERS*)

The second metaphor trajectory was about his use of the QS tools. Since the management of his health was framed as a complex and strenuous project, the self-tracker needed some help. In this way, the tools, visible or not, were personified (*QS TOOLS ARE PEOPLE*) and they were often conceptualised as people who were productive, capable, intelligent and supportive (*QS TOOLS ARE WORKERS, HAVE POWER AND VOLITION* and *ARE INTELLIGENT*). E.g.

(15) MyFitnessPal offers a smartphone app and a database of foods. (26)

(16) These sites all produce some reports and charts. (33)

(17) Was able to set up some projects that (40)

(18) allowed me to integrate the data from multiple sources (41)

(19) *Google Spreadsheets can use an API and Script to pull data from my FitBit account.*[42] (63)

From the discourse data, I could not tell why the blogger thought of the QS tools as friendly, helpful and kind, instead of threatening. However, my observation of the QS movement suggested that commercial self-tracking products were advertised in this way, foregrounding their benefits, while the academics, e.g. those who studied privacy problems, foregrounded the risks of such practices, calling them self-surveillance and participatory surveillance (see Whitson 2013: 167ff), because the QS tools might as well surreptitiously spy on their users. Another alternative trajectory was that the QS tools could be conceived as games (see ibid), but here the blogger focused on the work in lieu of fun for his self-monitoring activities. Since the QSer recruited those tools to help him manage his health, they must also have been considered reliable and trustworthy, so the tools were also put into a frame of rationality,

[42] A script or scripting involves human intelligence. However, arguably, "Script" here was a specialised term, so it might be delexicalised and used to refer literally to a series of computing instructions.

management and control, i.e. *QS TOOLS ARE OBJECTS OF RATIONALITY* and *CAN BE CONTROLLED*. E.g.

(20) It was well reviewed and reasonably priced. (16)

(21) Also can sync data to a health and wellness site run by my health insurance company. (48)

They were also treated as containers of money or valuable things, i.e. *QS TOOLS ARE CONTAINERS (OF VALUABLE THINGS)*. E.g.

(22) I invested in a new pedometer, the FitBitOne. (45)

(23) as does FitBit with a premium account. (71)

This was because the body data that the tools helped the QSer gather, process and store was framed as valuable resources (e.g. money). So the third metaphor trajectory I traced in his blog was about his conceptualisation of data.

The QSer used such systematic metaphors as *BODY DATA ARE MONEY* and *TIME*.

(24) *Also can sync data to a health and wellness site run by my health insurance company.*[43] (48)

(25) and automatically logs my weight and body fat data into my FitBit account.[44] (53)

(26) but a couple of clicks gets me a wealth of data on weight, calories in and out, sleep, steps, activity minutes, body fat, bmi. (68)

According Hwang and Levy (2015 online), data was nowadays frequently framed as liquid (e.g. data streaming), solid (e.g. data mining) or gas (e.g. cloud), so that these metaphorical expressions became unmarked in everyday discourse. Similarly, the blogger also thought of his own body data as solid object, e.g.

(27) how to get my blood pressure data into my Google Spreadsheet automatically (67) (*BODY DATA ARE OBJECTS (THAT CAN BE POSSESSED)*)

and liquid, e.g.

(28) allowed me to integrate the data from multiple sources (41) (*BODY DATA ARE WATER*)

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[43] Sync, short for synchronise, has a basic meaning of 'adjust (a clock or watch) to show the same time as another' – which has been entered in the contemporary English dictionary but not the learner's. Hence *DUPLICATING DATA ON DIFFERENT COMPUTERS IS LIKE ADJUSTING TIME ON DIFFERENT WATCHES*.

[44] the first definition of account, a basic meaning, in the learner's dictionary is 'an arrangement that somebody has with a bank, etc. to keep money there, take some out, etc,' hence *PUTTING DATA INTO AN ACCOUNT IS LIKE PUTTING MONEY INTO A BANK ACCOUNT*.

But he never framed the data as something useless or unwanted, such as "'data exhaust' – a term sometimes used to describe the metadata that are created in the course of day-to-day online lives" (ibid).

Furthermore, it was ambiguous who really owned the QSer's data. The blogger used *my* for 12 times in collocation with body/health data words such as *blood pressure*, *weight*, *diet* and *steps*, e.g.

(29) I'm logging my steps and weight on WalkerTracker and MyFitnessPal. (31)

(30) FitBit automatically tracks my steps, activity minutes, floors (57)

but it could be argued that the possessive phrases' meanings were to an extent indeterminate (see a discussion of Récanati (2001: 85) in Attardo 2005: 170f), i.e. they could signify the data was generated by the blogger or owned by him. From the examples of 29 and 30, I could see clearly that both the human or human body and the devices and apps were involved in data collection. In other words, although the data was collected during the QSer's bodily activities, the generation, transmission, processing and storage of the data all required the work of applications, computers and complex communication networks.

Again, this tied into Floridi's proposal to consider that people in the more developed areas "are increasingly living onlife," since "the threshold between here (*analogue, carbon-based, offline*) and there (*digital, silicon-based, online*) is fast becoming blurred" thanks to the proliferation of information and communication technologies (ICTs) in everyday life. (see Floridi 2014: 43ff).

There was linguistic evidence of metaphors in the QS blog studied here to support such a claim, i.e. *INFOSPHERE IS THE SAME AS ANTHROPOSPHERE.*

(31) The site allows you to compete and encourage friends (23)

(32) A tutorial by Ernesto Ramirez explains how to set this up. (64)

These two examples showed that reading a do-it-yourself instruction blog or watching an instruction video online was framed like having a class in a university, though they were two different sorts of realities; and the digital profiles, or avatars, on social network sites were like the blogger's offline, carbon-based friends.

This conceptual ambiguity, motivated by the aforementioned blurring in the social, technological context, could arguably entail some privacy problems, because in fact, the data could be accessed, or "owned" by the ICT providers legally, once a user electronically signed

off a user agreement. The user, nonetheless, probably had not understood or had time to read through its terms. For example, Google has always had access to all Gmail users' emails, which were stored on its servers, and it constantly mined or analysed them for its own profits, but the public only recently became aware of this issue (see Gibbs online). The unclear conceptualisation could be culpable for hindering the awareness in this case.

Lastly, I also wanted to argue that since *DATA ARE VALUABLE RESOURCES LIKE MONEY AND TIME*, companies would have incentives to compete for their possession, as long as they did not break the privacy laws.

5.4 Summary

In summary, I used the methods of MIP and SMA consecutively to exhaust in a principled manner all the linguistic and systematic metaphors in a representative prototypical blog, i.e. file 016_07_2, sampled from my proprietary QS corpus of 40 unique blogs. Based on the linguistic and systematic metaphors thus identified, I further traced three metaphor trajectories, or thought patterns, on the concepts of the self, QS tools and data throughout the QSer's blog text. I found that he thought his *HEALTH CONDITIONS WERE OBJECTS* that could be managed and controlled with hard work and the help of some self-tracking devices. He thought the *QS TOOLS WERE PEOPLE*, who were productive, capable, intelligent and friendly. Lastly, he conceived that his *DATA WERE VALUABLE RESOURCES*, whose ownership was unclear. Meanwhile, possible metaphor candidates, or alternative metaphors, along these trajectories were considered and discussed.

Altogether, they demonstrated the framing effects of metaphors, i.e. they could scaffold and constrain at the same time the blogger's understanding of the studied concepts. Future work would require metaphor analyses of more prototypical blogs from the corpus in order to understand a larger number of QSers' subjective experience.

Being put together, these cognitive frames can tell their own stories, as shown in the previous section, that may resemble, to some extent, the QSer's habitual ways of thinking, but also reflect the discrepancies between their thought and reality, and how their thoughts are entrenched and being limited in certain ways.

Arguably, this process of mind capturing involves a metaphorist's subjective decisions and experience, more so, perhaps, than the practice of reading brain images by a neuroscientist,

so the decisions made by the metaphor analyst are more rhetorical than scientific, as Miller (1990) would differentiate.

Using Aristotle's conceptualisation of rhetoric as a form of deliberation about 'things which seem to admit of issuing in two ways' (Rhetoric I.2.1357a, cited in Miller, idem: 162), she wrote,

> 'What is central to both the old, Aristotelian rhetoric [in ethics and politics] and to this new, extend rhetoric [in philosophy, science and the academic disciplines in general] is the function of deliberation, which is made possible and useful by uncertainty. Wayne Booth's definition of rhetoric highlights this central conception: "Rhetoric is the art of discovering warrantable beliefs and improving those beliefs in shared discourse" (Booth, 1974, xiii).' (idem)

In my application of both the MIP and SMA, I have found that most of the time I am not facing an obvious possibility but two, and the decisions I have to make are often not either/or but both. In other words, for example, the same lexical unit in one discourse community, being considered by most of its members as 'metaphorically used,' may be delexicalised and lose its metaphoricity in another discourse community. It may also become delexicalised as the reading purpose changes. In this way, counter-intuitively, the lexical unit can be both metaphorical and not. The same applies to the grouping of metaphor vehicles and topics, i.e. a vehicle or topic can be put into more than one certain group. This kind of deliberation about two possibilities throughout a series of decisions I make makes the metaphor analysis presented here more of an art (rhetoric) than science.

6. Limitations and future directions

The current research is so far one of the early attempts at a systematic, cognitively-informed critical metaphor analysis of the Quantified Self discourse and culture. My PhD project was initially formulated at an interdisciplinary doctoral training centre in the UK, led by human-computer interaction researchers, sociologists of science and technology studies and a feminism political scholar. The methodology was ethnomethodological, particularly the grounded theory, and critical discourse analysis. Then my project was taken to the School of English in China, which mixed in strong positivism elements. This has become methodologically interesting but also challenging, as I have tried to ground and situate the naïve positivism, giving to airy nothing a local habitation and a name, so to speak. So there have been some limitations to this research, which will be carefully avoided or overcome in my future research.

First, I have only applied Conceptual Metaphor Theory (CMT) and Systematic Metaphor Analysis, and in practice the CMT, though much sophisticated for conceptual level analysis, turned out to be insufficient for tracing the socio-cultural and historical implications. As Pishwa (2009: 1) pointed out, 'Cognitive linguists have made revolutionary discoveries concerning the explanation of the nature of language and its functions in recent decades. The findings are, however, concerned with knowledge representations and the processes required for its management with a heavy emphasis on the effect of human perception. Social aspects have not been considered as explanatory factors for the properties of language and its use despite the usage-based foundation; Chilton (this volume) argues, however, that cognitive linguistics "assumes that social meanings exist in people's minds". But this has not been tackled yet. Even other linguistic fields have failed to include social aspects of language despite the assumption that it is meant to serve neither as a communication tool for individuals in isolation nor as a mere knowledge-retrieving device.' So in the future, I will have to go beyond CMT, as the late Van den Boomen has urged. I will apply more socio-semiotic-oriented methods such as the media-specific analysis using material metaphors, proposed by Hayles (2002) and developed by Van den Boomen (2014), to trace the

signification mappings and the discourse metaphor method (Zinken, Hellsten, Nerlich 2008)[45].

Second, with regard to the prototypical sampling method, it was still not ideal, because the prototypicality was based on keywords rather than metaphors. However, this is a compromise, because without a manually-tagged large metaphor reference corpus, it is difficult to generate prototypicality scores based on metaphors. At the moment, few computer algorithms, if any, can reliably identify metaphors. Besides, metaphoricity perhaps is always about subjective construal (for most metaphors), and cannot be reduced to numerical calculations.

What we really need is a guiding framework for making systematic and principled judgements. So corpus tools served such a purpose. As corpus linguist O'Halloran pointed out, corpus linguistic method 'substantially reduces partiality and arbitrariness in manual analysis of data.' (2017: 202) Moreover, '[t]he investigation of large amounts of language data in electronic form brings significant advantages. First, linguists are able to discover things about language use which may otherwise remain invisible. Second, investigation of a corpus provides a quantitative, and thus robust, basis for confirming or falsifying intuitions about language use. This means that linguists no longer have to speculate about how people generally use a language, something which is obviously prone to error. Third, the labour, time-drain and tedium of manual analysis of large quantities of language use data have been substantially shrivelled.' (ibid: 101-102)

O'Halloran concurred 'with Hayles' vision of the posthuman as the affordance of new subjectivities through use of intelligent technologies…That is to say, use of the web, digitised corpora and digital text analysis affords the creation of new subjectivities which rely on machinic supplementation – hence posthuman.' (ibid: 300) Therefore, using corpus methods to critically investigate socio-culturally important discourses will also be a posthumanist ethical project worth pursuing in the future.

Third, in this research I have only systematically analysed QS blog texts, while forgoing other primary data sources, such as news reports, QS meetup presentations (video

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[45] Gibbs (2017: 125-128) has disputed with discourse metaphors, citing psychological experiments as evidence to show that CMT did not ignore socio-cultural factors, but it was not convincing enough, because Gibbs still worked from an individualist perspective. An emerging branch of neuroscience known as cultural neuroscience has shown that cultural specificity could influence human's brain responses to cultural and emotional stimuli (c.f. Chiao et al 2013).

recordings), app interfaces, QSer interviews and, possibly, coding scripts. In the future, I plan to learn and incorporate the research methods from visual/material cultural studies and software studies, perhaps also collaborate with other researchers with compatible interests and complementary skills, so that my analysis can become multimodal and collaborative.

Last but not the least, I want to mention another future research direction, that is the socio-semiotics of authenticity in reinvention societies. QSers are actively involved in a self-project of continuous self-reinvention. Here I refer to the concept of reinvention by Anthony Elliott (2013), a student of Giddens. He used reinvention to refer to a period of contemporary history coming after Gidden's society of reflexivity and reflexive self, when the self-reinvention was facilitated by digital and ICT technologies. Elliott demonstrated with examples on multiple social levels that the mandate for continuous self-reinvention or makeover in the polished, expensive cities of the West was a result of the new (digital) economy, which was largely based on short-term projects and thus required from the middle-class workers ever-increasing flexibility and mobility, with an unintended consequence of precarity.

Elliott (ibid) indicated that for the middle-class to pursue the utopia of success, they had to catch up with the speed of reinvention and be flexible, because projects and profits were quick to run out and competition was high. It thus invariably demanded a certain amount of inauthenticity. The Oprah shows were said to be a prime example that ushered in this inauthentic culture and serial self-reinventions for success, however transitory each period of success was. Now we have witnessed an explosion of Instagram, Facebook and TikTok celebrities thanks to the rise of Web 2.0, whereas famous actors are arguably few and far between.

Under such new circumstances and uncertainties, what I have observed in the QS movement is a struggle for authenticity, or more precisely 'bounded authenticity,' which still allows the people liberty and flexibility (c.f. Elizabeth Bernstein (2007), where she invented such a concept for transactional (sex) relations.) In digital/gig economy, people are increasingly involved in such transactional, instead of reciprocal, relations. A Uber driver, or a Deliveroo cyclist, gets not only paid for each delivery but also rated. The project deliverables and KPIs as well as the whole audit culture in the world's more developed regions put the workers in the shackles of external monitoring, or ubiquitous surveillance, forming new posthuman social relations.

Then it will be worth studying how people manage their identities and the boundaries of their bounded authentic selves through computer mediated discourses, especially when they can have multiple subjectivities.

Appendix

Top 100 keywords (ranked by keyness, descending, continued from left to right)

Keyword	Freq	Keyness	Effect
fitbit	60	961.117043072	36071394.9419
hrv	47	690.152143771	1086669.39889
tessel	19	304.337511805	11422540.0649
anki	17	264.577812018	5110028.45011
runkeeper	14	224.247236035	8416582.15312
myfitnesspal	14	224.247236035	8416582.15312
twilio	14	224.247236035	8416582.15312
accelerometer	15	212.748243284	644033.838249
rescuetime	13	201.025048869	3907645.28538
arduino	12	192.21141708	7214198.98839
splunk	10	160.175764714	6011815.82365
rmssd	9	144.158000928	5410624.24129
bodymedia	8	128.140278802	4809432.65892
myofascial	9	128.112375354	676240.530161
yxyy	6	96.1049593366	3607049.49419
withings	6	96.1049593366	3607049.49419
assimil	5	80.0873620593	3005857.91183
beeminder	5	80.0873620593	3005857.91183
mmal	4	64.0698064391	2404666.32946
pyserial	4	64.0698064391	2404666.32946
gsr	4	59.0664473397	1202283.16473
macbook	3	48.0522924112	1803474.7471
reddit	3	48.0522924112	1803474.7471
raspi	3	48.0522924112	1803474.7471
walkertracker	3	48.0522924112	1803474.7471
echonest	3	48.0522924112	1803474.7471
duolingo	3	48.0522924112	1803474.7471
yaml	3	48.0522924112	1803474.7471
startmotion	3	48.0522924112	1803474.7471
beeminding	3	48.0522924112	1803474.7471
tweeted	3	48.0522924112	1803474.7471
sweetbeat	3	48.0522924112	1803474.7471
kickstarter	3	48.0522924112	1803474.7471
hdmi	3	43.5542764178	901687.373548
batlog	2	32.0348199745	1202283.16473
sendtext	2	32.0348199745	1202283.16473
fitbits	2	32.0348199745	1202283.16473
mobilitywod	2	32.0348199745	1202283.16473
nathanclaus	2	32.0348199745	1202283.16473
pawtrack	2	32.0348199745	1202283.16473
humanbenchmark	2	32.0348199745	1202283.16473
fitbitone	2	32.0348199745	1202283.16473
danceability	2	32.0348199745	1202283.16473
github	2	32.0348199745	1202283.16473
raspistill	2	32.0348199745	1202283.16473
trackerfy	2	32.0348199745	1202283.16473
trendweight	2	32.0348199745	1202283.16473
beemind	2	32.0348199745	1202283.16473
sleeplogger	2	32.0348199745	1202283.16473
zzap	2	32.0348199745	1202283.16473
thegiftofdata	2	32.0348199745	1202283.16473
zzaps	2	32.0348199745	1202283.16473
plotly	2	32.0348199745	1202283.16473
nootropic	2	32.0348199745	1202283.16473
lumoback	2	32.0348199745	1202283.16473
tictrac	2	32.0348199745	1202283.16473
sensoria	2	28.216400156	601091.582365
moskovitz	1	16.0173891925	601091.582365
edimax	1	16.0173891925	601091.582365

Continued on page 143.

61	**hubofallthings**	1	16.0173891925	601091.582365
62	**catalyzers**	1	16.0173891925	601091.582365
63	**instructable**	1	16.0173891925	601091.582365
64	**dataeh**	1	16.0173891925	601091.582365
65	**hubspot**	1	16.0173891925	601091.582365
66	**ferenstein**	1	16.0173891925	601091.582365
67	**ifttt**	1	16.0173891925	601091.582365
68	**beddit**	1	16.0173891925	601091.582365
69	**iwconfig**	1	16.0173891925	601091.582365
70	**geolocations**	1	16.0173891925	601091.582365
71	**khatzumoto**	1	16.0173891925	601091.582365
72	**aereo**	1	16.0173891925	601091.582365
73	**vgm**	1	16.0173891925	601091.582365
74	**lowbluelights**	1	16.0173891925	601091.582365
75	**rikakis**	1	16.0173891925	601091.582365
76	**lancets**	1	16.0173891925	601091.582365
77	**mokestrel**	1	16.0173891925	601091.582365
78	**bodytempf**	1	16.0173891925	601091.582365
79	**feltron**	1	16.0173891925	601091.582365
80	**marianaquiroga**	1	16.0173891925	601091.582365
81	**mycolname**	1	16.0173891925	601091.582365
82	**backjoy**	1	16.0173891925	601091.582365
83	**wegerif**	1	16.0173891925	601091.582365
84	**quiroga**	1	16.0173891925	601091.582365
85	**mobilitywods**	1	16.0173891925	601091.582365
86	**rdio**	1	16.0173891925	601091.582365
87	**égyptien**	1	16.0173891925	601091.582365
88	**dxa**	1	16.0173891925	601091.582365
89	**barfod**	1	16.0173891925	601091.582365
90	**scrobbling**	1	16.0173891925	601091.582365
91	**quantifiedself**	1	16.0173891925	601091.582365
92	**sleepbot**	1	16.0173891925	601091.582365
93	**verbling**	1	16.0173891925	601091.582365
94	**fuelband**	1	16.0173891925	601091.582365
95	**additionnaly**	1	16.0173891925	601091.582365
96	**launchctl**	1	16.0173891925	601091.582365
97	**bunki**	1	16.0173891925	601091.582365
98	**nwcr**	1	16.0173891925	601091.582365
99	**accountsid**	1	16.0173891925	601091.582365
100	**psk**	1	16.0173891925	601091.582365
101	**gpio**	1	16.0173891925	601091.582365

References

A

Adkins, Lisa and Lury, Celia. 2012. Introduction: special measures, in *The Sociological Review*, 59(s2): 5-23.

American National Corpus Project, 2016, http://www.anc.org/data/oanc/contents/

Anderson, Chris. 2008. online. “The End of Theory: The Data Deluge Makes the Scientific Method Obsolete.” https://www.wired.com/2008/06/pb-theory/ (18 April 2019)

Anderson, R. J. 2014. online. Spying On Myself. *sanspoint. 14 July 2014* [online: weblog].: http://www.sanspoint.com/archives/2014/07/14/spying/ (8 June 2015)

Anonymous. 2016. So happy for Hangzhouers ! Country's longest rubber track at doorstep ! (杭州人太幸福！全国最长的塑胶跑道就在家门口！) Qianjiang Evening News. 6 April 2016. https://zj.zjol.com.cn/news/310760.html

Anthony, Laurence. (2017). AntConc (Version 3.5.0) [Computer Software]. Tokyo, Japan: Waseda University. Available from http://www.antlab.sci.waseda.ac.jp/

Anthony, Laurence. Baker, Paul. 2015. ProtAnt: A tool for analysing the prototypicality of texts. *International Journal of Corpus Linguistics*, 20(3), 273-292.

Anthony, Laurence. Baker, Paul. 2015 July. ProtAnt: A Freeware Tool for Automated Prototypical Text Detection. In F. Formato and A. Hardie (Eds). Proceedings of Corpus Linguistics 2015 (pp. 24-26). Lancaster, UK: Lancaster University. Accessed on 16 Apr 2016 http://www.laurenceanthony.net/research/20150720_24_cl_2015/cl_2015_anthony_baker_paper_final.pdf

Arendt, Hannah. 1958. *The Human Condition*. Chicago: The University of Chicago Press.

Aristotle. 1926. “Art” of Rhetoric. Trans. J. H. Freese. Cambridge: Harvard University Press.

Aristotle, and Lord, C. (trans.) (1984) *Politics*, Chicago.

Attardo, Salvatore. 2005. “The Role of Affordances at the Semantics/Pragmatics Boundary”. http://csjarchive.cogsci.rpi.edu/Proceedings/2005/docs/p169.pdf (16 April 2017)

B

Barbrook, Richard. Cameron, Andy. 2001. Californian Ideology, in Ludlow, P. (ed.) *Crypto anarchy, cyberstates, and pirate utopias,* Cambridge, Massachusetts; London, England: The MIT Press: 363-387.

Bateson, Gregory. 1972. The cybernetics of “self”: a theory of alcoholism [1971], reprinted in

Steps to an ecology of mind, New York.

Baym, Nancy K. 2006. Language in Computer-Mediated Communication, in Brown, K. (ed.) *Encyclopedia of Language and Linguistics 2nd Edition*, Elsevier Science: 523-529.

Bal, P Matthijs. Veltkamp, Martijn. 2013. How Does Fiction Reading Influence Empathy ? An Experimental Investigation on the Role of Emotional Transportation. PLoS ONE 8(1): e55341. https://doi.org/10.1371/journal.pone.0055341

Baritz, Loren. 1982. *The good life: The meaning of success for the American middle class*. New York: Harper & Row.

Bellah, Robert N. Madsen, Richard. Sullivan, Wiliam M. Swidler, Ann. Tipton, Steven M. 1985. *Habits of the heart: Individualism and commitment in American life*. New York: Harper & Row.

Bernard, H. Russell. 2011. Research methods in anthropology : qualitative and quantitative approaches, Plymouth: AltaMira Press.

Bernstein, Elizabeth. 2007. *Temporarily yours : intimacy, authenticity, and the commerce of sex*. Chicago: The University of Chicago Press.

Best, K. (2010). Living in the control society : Surveillance, users and digital screen technologies. *International Journal of Cultural Studies*, 13(1), 5-24.

Bhattacharya, Ananya. 2015. “Fitbit is now worth $4.1 billion after IPO”. https://money.cnn.com/2015/06/17/investing/fitbit-ipo/index.html (19 September 2019)

Bleecker, J. 2009. Design Fiction: A Short Essay on Design, Science, Fact and Fiction.

Blythe, M. 2014a. “The Hitchhiker’s Guide to Ubicomp: Using Techniques from Literary and Critical Theory to Reframe Scientific Agendas.” *Personal and Ubiquitous Computing*, Vol 18, No. 4: 795-808.

Blythe, M. 2014b. “Research through Design Fiction: Narrative in Real and Imaginary abstracts.” CHI '14 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 2014, pp 703-712.

Blythe, M. Wright, P. 2006 “Pastiche Scenarios: Fiction as a Resource for User Centred Design.” *Interacting with Computers*, Vol 18, No. 5: 1139–1164.

Boghossian, Paul A. 2002. The Rule-Following Considerations, in Miller, A. Wright, C. (eds.) *Rule-Following and Meaning*. Montreal & Kingston: McGill-Queen's University Press.

Bondi, Marina., Cacchiani, Silvia. Mazzi, Davide. (eds.) 2015. *Discourse In and Through the Media: Recontextualizing and Reconceptualizing Expert Discourse*. Newcastle upon Tyne: Cambridge Scholars Publishing.

Booth, W.C., 1974. *Modern dogma and the rhetoric of assent.* University of Chicago Press.

Booth, W. C. (1988) *The company we keep: an ethics of fiction*, Berkeley: University of California Press.

Bosker, B. 2016. The binge breaker. *The Atlantic*, November. www.theatlantic.com/magazine/archive/2016/11/the-binge-breaker/501122/

Bradley, F.H. 1951. *Ethical studies* [1876], 2d edition, 1927, reprint, New York.

Braidotti, Rosi. 2013. *The Posthuman.* Cambridge: Polity Press.

Butterworth, M. L. 2014. "Nate Silver and Campaign 2012 : Sport, the Statistical Frame, and the Rhetoric of Electoral Forecasting". *Journal of Communication,* 64(5): 895-914.

C

Caldas-Coulthard, C.R. (2005) Personal web pages and the semiotic construction of academic identities, in Caldas-Coulthard, C.R. and Toolan, M. (eds.) *The writer's craft, the culture's technology*, London & New York: Rodopi: 23-46

Caluya, Gilbert. 2010. The Post-Panoptic Society? Reassessing Foucault in Surveillance Studies. *Social Identities* 16(5): 621-33.

Cameron, Lynne. 2010. The discourse dynamics framework for metaphor, in Cameron, L. Maslen, R. (eds.) *Metaphor analysis : research practice in applied linguistics, social sciences and the humanities,* London ; Oakville, Connecticut : Equinox.

Cameron, Lynne. n.d. "A Discourse Dynamics Framework for Metaphor". http://creet.open.ac.uk/projects/metaphor-analysis/theories.cfm?paper=ddfm (13 January 2017).

Cameron, Lynne., Low, Graham. Maslen, Robert. 2010. Finding systematicity in metaphor use, in Cameron, L. Maslen, R. (eds.) *Metaphor analysis : research practice in applied linguistics, social sciences and the humanities,* London ; Oakville, Connecticut : Equinox.

Cameron, Lynne. Maslen, Robert. Todd, Zazie. Maule, John. Stratton, Peter. Stanley, Neil. 2009. The discourse dynamics approach to metaphor and metaphor-led discourse analysis. *Metaphor and Symbol*, 24(2) pp. 63–89.

Carrigan, Mark. 2015. How the digital elites do festivals. https://markcarrigan.net/2015/11/07/how-the-digital-elites-do-festivals/ (20 September 2019)

Carnap, Rudolf. 1928. *The Logical Structure of the World*. Berkeley, CA: University of California Press.

Chandler, David. 2015. "A World Without Causation: Big Data and the Coming of Age of Posthumanism." *Millennium: Journal of International Studies* 43, no. 3: 833–851.

Chen, Jonathan H. Asch, Steven M. 2017. "Machine Learning and Prediction in Medicine—Beyond the Peak of Inflated Expectations." *The New England Journal of Medicine* 376, no. 26: 2507–2509.

Chiao, Joan Y. Cheon, Bobby K. Pornpattananangkul, Narun. Mrazek, Alissa J. Blizinsky, Katherine D. 2013. Cultural Neuroscience: Progress and Promise, in *Psychological Inquiry*, 24:1, 1-19, DOI: 10.1080/1047840X.2013.752715

Chilton, Paul. 2005. Manipulation, memes and metaphors: The case of Mein Kampf, in de Saussure, L. and Schulz, J.P. (eds.) *Manipulation and Ideologies in the Twentieth Century : Discourse, language, mind*, Amsterdam: John Benjamins.

Ciepiela, K. (2011) From language as an identity marker to language as a toolkit for identity performance, in Ciepiela, K. (ed.) *Identity through a Language Lens*, Frankfurt am Main: Peter Lang AG.

Clay, Kelly. 2013. "CES 2013: The Year of The Quantified Self?". http://www.forbes.com/sites/kellyclay/2013/01/06/ces-2013-the-year-of-the-quantified-self/ (16 January 2015).

Corbett, John. 2006. Popularizations, in Brown, K. (ed.) *Encyclopedia of Language and Linguistics 2nd Edition*, Elsevier Science: 755-759.

Corbin, J. Strauss, A. 2007. *Basics of qualitative research: Techniques and procedures for developing grounded theory, 3e*. Sage publications.

Crosby, Alfred W. 1997. *The measure of reality : quantification in Western society, 1250-1600*. Cambridge: Cambridge University Press.

D

D'Andrade, Roy. 1987. A Folk Model Of The Mind, in Holland, D. Quinn, N. (eds.) *Cultural models in language and thought*, Cambridge: Cambridge University Press

D'Andrade, Roy. 1995. Models and theories. In *The Development of Cognitive Anthropology*

Cambridge: Cambridge University Press: 150-181.
Damasio, Antonio. 2000. *The Feeling of What Happens: Body and Emotion in the Making of Consciousness*. New York: Mariner Books.
Damasio, Antonio R. 2010. *Self comes to mind : constructing the conscious brain*. New York: Pantheon Books.
Dawkins, Richard. (1976). *The Selfish Gene*. Oxford: Oxford University Press.
Dawkins, Richard. (1982). *The Extended Phenotype*. Oxford: Oxford University Press.
Dawkins, Richard. (1993). Viruses of the mind, in B. Dahlbohm (Ed.), *Dennett and his Critics: Demystifying the Mind* (pp. 13–27). Oxford: Blackwell.
De Pierris, Graciela Teresa. 2015. Ideas, evidence, and method : Hume's skepticism and naturalism concerning knowledge and causation. Oxford University Press.

Dehaene, Stanislas. 2009. "Conscious and Nonconscious Processes: Distinct Forms of Evidence Accumulation." *Séminaire Poincaré* 12:89– 114. http://www.bourbaphy.fr/ dehaene.pdf.
Deignan, Alice. 2010. The cognitive view of metaphor : Conceptual metaphor theory, in Cameron, L. Maslen, R. (eds.) *Metaphor analysis : research practice in applied linguistics, social sciences and the humanities,* London ; Oakville, Connecticut : Equinox.
Deignan, Alice., 2015. MIP, the corpus and dictionaries: what makes for the best metaphor analysis?. *Metaphor and the Social World*, 5(1): 145-154.
Deignan, Alice. Littlemore, Jeannette. Semino, Elena. 2013. *Figurative language, genre and register*. Cambridge University Press.
Deleuze Gilles. 1992. Postscript on the Societies of Control, *October* Vol. 59 (Winter, 1992), pp. 3-7.
Dennett, D. (1991). *Consciousness Explained*. London: Penguin.
Dewey, J. (1922) *Human nature and conduct: an introduction to social psychology*, New York.
Duhigg, Charles. 2012. How Companies Learn Your Secrets. *The New York Times*. 8 December 2020. https://www.nytimes.com/2012/02/19/magazine/shopping-habits.html
Dunning, Ted. 1993. 'Accurate methods for the statistics of surprise and coincidence', Computational Linguistics 19 (1): 61–74.

E

Edelman, Gerald M. 1987. *Neural Darwinism: The Theory of Neuronal Group Selection*. New York: Basic Books.

Elliott, Anthony. 2013. *Reinvention*. London: Routledge.

Espeland, Wendy Nelson. Lom, Stacy E. 2015. Noticing Numbers : How Quantification Changes What We See and What We Don't, in Kornberger, M. Justesen, L. Mouritsen, J. Madsen, AK.(eds.) *Making Things Valuable* Oxford Scholarship Online: October 2015 DOI:10.1093/acprof:oso/9780198712282.003.0002 (8 May 2019)

F

Fauconnier, Gilles. (1994). *Mental Spaces*. Cambridge, MA: MIT Press.

Fauconnier, Gilles. (1997). *Mapping in Thought and Language*. Cambridge: Cambridge University Press.

Fauconnier, Gilles. & Turner, Mark. (2002). *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities*. New York: Basic Books.

Fawkes, John. 2015. I measured my brain waves and task performance on caffeine - here's what I found, *John Fawkes,* http://johnfawkes.com/i-measured-my-brain-waves-and-task-performance-on-caffeine-heres-what-i-found/ (13 May 2015)

Ferguson, Niall. (2017). The False Prophecy of Hyperconnection. Foreign Affairs, 96(5): 68–79. https://www.foreignaffairs.com/articles/2017-08-15/false-prophecy-hyperconnection.

Floridi, Luciano. 2014. *The fourth revolution: How the infosphere is reshaping human reality*. OUP Oxford.

Ferrando, Francesca. 2019. *Philosophical Posthumanism*. London: BLOOMSBURY ACADEMIC.

Forceville, Charles J. 2006. Non-verbal and multimodal metaphor in a cognitivist framework: Agendas for research, in Kristiansen, G. Achard, M. Dirven, R. Ruiz de Mendoza Ibáñez, F. (eds.) *Cognitive Linguistics: Current Applications and Future Perspectives*, Berlin/New York: Mouton de Gruyter: 379– 402.

Foucault, Michel.1970 [1966]. *The Order of Things: An Archaeology of the Human Sciences*. Translated by A. Sheridan. New York: Random House.

Foucault, Michel. 1983a. The subject and power, in Dreyfus, H.L. and Rainbow, P. (eds.) *Michel Foucault: beyond structuralism and hermeneutics*, 2nd edition, Chicago: The

University of Chicago Press. pp. 208-226

Foucault, Michel. 1983b. "Self Writing." Dits et écrits, Vol IV: 415-430.

Foucault, Michel. 1988. Technologies of the Self, in Martin, L.H., Gutman, H. and Hutton, P.H. (eds) *Technologies of the self: a seminar with Michel Foucault*, London: Tavistock, pp.16-49.

Foucault, Michel. 1995. *Discipline and Punish: The Birth of the Prison*. Translated by A. Sheridan. 2nd edn. New York:Vintage Books.

Foucault, Michel. 2006. “Utopian Body.” Sensorium: embodied experience, technology, and contemporary art: 220-234.

G

Gabriel, Yiannis. Lang, Tim. 2006. *The Unmanageable Consumer Second Edition*. London: SAGE Publications.

Gabrielatos, C. Marchi, A.. 2012. Keyness: Appropriate metrics and practical issues. CADS International Conference 2012. Corpus-assisted Discourse Studies: More than the sum of Discourse Analysis and computing?, 13-14 September, University of Bologna, Italy.

Geertz, Clifford. 1980. Blurred Genres: the refiguration of social thought. *The American Scholar*, 49(2): 165-179

Gibbs, Jr. Raymond W. 2017. *Metaphor wars : conceptual metaphors in human life*. New York: Cambridge University Press.

Gibbs, Samuel. 2014. Gmail does scan all emails, new Google terms clarify. *The Guardian*, Tuesday 15 April 2014. https://www.theguardian.com/technology/2014/apr/15/gmail-scans-all-emails-new-google-terms-clarify

Gieryn, Thomas. 1983. Boundary Work and the Demarcation of Science from Non-Science : Strains and Interests in Professional Ideologies of Scientists. *American Sociological Review* 48: 781–95.

Goodley, Dan. 2014. “The Posthuman.” *Disability & Society* 29, no. 5, 844–846.

Gregersen, Erik. online. Linear programming. *Encyclopaedia Britannica*. 9 December 2020. https://www.britannica.com/science/linear-programming-mathematics

Guilbeault, Douglas. Finkelstein, Joel. 2019. Human-Bot Ecologies, in Papacharissi, Z (ed.) *A networked self and human augmentics, artificial intelligence, sentience*, NewYork : Routledge, Taylor & Francis Group: 152-186.

H

Hayles, N Katherine. 1999. *How we became posthuman : virtual bodies in cybernetics, literature, and informatics*. Chicago: The University of Chicago Press.

Hayles, N Katherine. 2002. *Writing machines*. Cambridge, Massachusetts: The MIT Press.

Hayles, N Katherine. 2005. *My mother was a computer: digital subjects and literary texts*. Chicago: The University of Chicago Press.

Hayles, N Katherine. 2017. *Unthought : the power of the cognitive nonconscious*, Chicago: The University of Chicago Press.

Herring, Susan. Androutsopoulos, Jannis. 2015. Computer-Mediated Discourse 2.0, in Deborah Tannen, Heidi E. Hamilton, Deborah Schiffrin (eds.) *The Handbook of Discourse Analysis, Second Edition,* John Wiley & Sons.

Herring, Susan. 2004. Computer-Mediated Discourse Analysis. In S. Barab, R. Kling, & J. Gray (Eds.), *Designing for Virtual Communities in the Service of Learning* (Learning in Doing: Social, Cognitive and Computational Perspectives, pp. 338-376). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511805080.016

Hollinger, Veronica. 2009. "Posthumanism and Cyborg Theory." In *The Routledge Companion to Science Fiction*, edited by Mark Bould, Andrew M. Butler, Adam Roberts, and Sherryl Vint, 267–278. Abingdon and New York: Routledge.

Hood, Bruce M. 2012. The self illusion : why there is no "you" inside your head. New York: Oxford University Press.

Hwang, Tim. Levy, Karen. 2015. 'The Cloud' and other dangerous metaphors. *The Atlantic*, 20. https://www.theatlantic.com/technology/archive/2015/01/the-cloud-and-other-dangerous-metaphors/384518/ (16 August 2015)

J

Jackendoff, R. 2002. *Foundations of Language. Brain, Meaning, Grammar, Evolution*, Oxford: Oxford University Press.

Jameson, Fredric. 1981. *The political unconscious: narrative as a socially symbolic act*, Ithaca, N.Y: Cornell University Press.

Jameson, Fredric. 1991. *Postmodernism, or, The Cultural Logic of Late Capitalism.* Verso.

Jones, Rodney. 2015. Discourse, cybernetics, and the entextualization of the self. In Jones, R. Chik, A. Hafner, C. A. (eds.) *Discourse and digital practices: Doing discourse analysis in the digital age*. Abingdon: Routledge. 28-47

K

Keesing, Roger M. 1987. Models, "Folk" and "Cultural", in Holland, D. Quinn, N. (eds.) *Cultural models in language and thought*. Cambridge University Press.

Kaye, J. Dourish, P. 2014. "Special Issue on Science Fiction and Ubiquitous Computing." *Personal and Ubiquitous Computing*, Vol 18, No. 4: 765-766.

Kelly, Kevin. 2007. "What is the Quantified Self?". http://quantifiedself.com/2007/10/what-is-the-quantifiable-self/ (9 June 2015).

Kelly, Kevin. 2012. "On The History and Future of QS". http://quantifiedself.com/kevin-kelly/ (24 May 2015).

Kenney, Martin. Zysman, John. 2016. The Rise of the Platform Economy. *Issues in Science and Technology* XXXII(3), SPRING. issues.org/the-rise-of-the-platform-economy/ (18 May 2019)

Kidd, David Comer. Castano, Emanuele. 2013. Reading Literary Fiction Improves Theory of Mind. Science Vol. 342, Issue 6156: 377-380. DOI: 10.1126/science.1239918

Kornberger, Martin. Justesen, Lise. Madsen, Anders Koed. Mouritsen, Jan. 2015. Introduction, in Kornberger, M. Justesen, L. Mouritsen, J. Madsen, AK.(eds.) *Making Things Valuable* Oxford Scholarship Online: October 2015 DOI:10.1093/acprof:oso/9780198712282.003.0001 (11 May 2019)

Kövecses, Zoltán. 1986. *Metaphors of Anger, Pride, and Love: A Lexical Approach to the Structure of Concepts,* Amsterdam/Philadelphia: John Benjamins B.V

Kumar, Krishan. 1987. "Utopianism Ancient and Modern," in *Utopia and anti-Utopia in modern times,* Blackwell: 2-32.

Kumar, Krishan. 1999. "The Elements of Utopia." Utopianism: 1-19.

L

Lacan, J. and Wilden, A. (trans.) (1968) *The language of the self: the function of language in psychoanalysis* [1956], Baltimore.

Lacan, J. and Sheridan, A. (trans.) (1978) *The four fundamental concepts of psycho-analysis* [1973], Miller J.-A. (ed.), New York.

Lakoff, George. 1987. *Women, fire, and dangerous things : what categories reveal about the mind*, Chicago : University of Chicago Press.

Lakoff, George. 1993. The Contemporary Theory of Metaphor, in Ortony, A. (ed.) *Metaphor and Thought*, 2nd edition, Cambridge: Cambridge University Press: 202-251.

Lakoff, George. 2008a. *The political mind: why you can't understand 21st-century politics with an 18th-century brain*, New York: Penguin Group.

Lakoff, George. 2008b. CHAPTER 1 : The Neural Theory of Metaphor, in Gibbs Jr, Raymond W (ed). *The Cambridge Handbook of Metaphor and Thought*. Cambridge: Cambridge University Press: 17-38.

Lakoff, George. Johnson, Mark. 2003 [1980]. *Metaphors we live by*, Chicago: University of Chicago Press.

Lakoff, George. Johnson, Mark. 1999. *Philosophy in the flesh : the embodied mind and its challenge to Western thought*, New York, Basic Book.

Lakoff, George. Kövecses, Zoltán. 1987. The cognitive model of anger inherent in American English, in Holland, D. Quinn, N. (eds.) *Cultural models in language and thought*, Cambridge: Cambridge University Press

Landes, D. 1983. Revolution in Time : Clock and the Making of the Modern World. Cambridge, MA : Harvard University Press.

Latour, Bruno. 1985. Visualisation and Cognition : Drawing Things Together, in H. Kuklick (ed.) *Knowledge and Society Studies in the Sociology of Culture Past and Present*, Jai Press vol. 6: 1-40

Latour, B., & Woolgar, S. 1979. *Laboratory life: The construction of scientific facts*. Princeton, NJ: Princeton University Press.

Levitas, Ruth. 2010. “Introduction.” in The concept of Utopia: 1- 9.

Lister, M., Dovey, J., Gildings, S. Aand Kelly, K. (2003) *New media: a critical introduction*, London and New York: Routledge.

Lukacs, G. 1963. The ideology of modernism, in Mander, J. and Mander, N. (trans.) *The meaning of contemporary realism* [1947], London.

Lupton, Deborah. 2012. “The quantified self movement: some sociological perspectives”. https://simplysociology.wordpress.com/2012/11/04/the-quantitative-self-movement-some-sociological-perspectives/ (26 May 2015).

Lupton, Deborah. 2013a. Understanding the Human Machine, *IEEE Technology and Society Magazine*, Winter, pp.25-30.

Lupton, Deborah. 2013b. *The Social Worlds of the Unborn*. Houndmills: Palgrave Macmillan.

Lupton, Deborah. 2013c. Swimming or drowning in the data ocean? Thoughts on the metaphors of big data, https://simplysociology.wordpress.com/2013/10/29/swimming-or-drowning-in-the-data-ocean-thoughts-on-the-metaphors-of-big-data/ (9 December 2016)

Lupton, Deborah. 2013d. "Thinking about Fat: A Review of Different Perspectives." Fat: 14-31.

Lupton, Deborah. 2015a. Quantified sex: a critical analysis of sexual and reproductive self-tracking using apps. *Culture, Health & Sexuality* 17:4, 440-453

Lupton, Deborah. 2015b. *Digital Sociology*. Oxon & New York: Routledge

Lyon, David. 2007. *Surveillance Studies: An Overview*. Cambridge: Polity Press

M

Markussen, T. Knutz, E. 2013. "The Poetics of Design Fiction." DPPI '13 Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces, 231-240.

Martinez, A. 2016. *Chaos monkeys: Obscene fortune and random failure in Silicon Valley*. New

York:Harper.

Marx, Karl. 1964. Passages from *Economic,and philosophical manuscripts* [1844], in Bottomore, T.B. and Rubel, M. (eds.) Bottomore, T.B. (trans.) *Selected writings in sociology and social philosophy*, New York.

McCloskey, Deirdre. 1994. *The Rhetorics of Economics*. Madison: University of Wisconsin Press.

McEnery, Tony. Hardie, Andrew. 2012. *Corpus Linguistics: Method, theory and practice*. Cambridge: Cambridge University Press.

Mead, G.H. (1982) *The individual and the social self: unpublished work of George Herbert Mead*, [Class lectures in social psychology, 1914 and 1927], Chicago.

Miller, Alexander. 2006. Rules and Rule-Following, in Brown, K. (ed.) *Encyclopedia of Language and Linguistics 2nd Edition*, Elsevier Science: 685-688.

Miller, C.R., 1990. The rhetoric of decision science, or Herbert A. Simon says, in Simons, H.W. (eds.) *The rhetorical turn: Invention and persuasion in the conduct of inquiry*.

University of Chicago Press, pp. 162-184.
Miller, G.A. (1993) Images and models, similes and metaphors, in Ortony, A. (ed.) *Metaphor and Though, 2nd ed*, Cambridge: Cambridge University Press. pp.357-400
Mittelstadt, B.D. 2013. On the Ethical Implications of Personal Health Monitoring: A Conceptual Framework for Emerging Discourses (PhD thesis) 235-274.
Morson, Gary Saul. Emerson, Caryl. 1990. *Mikhail Bakhtin: Creation of a Prosaics*. Stanford: Stanford University Press.
Moylan, Tom. 1986. "Introduction: the Critical Utopia," in *Demand the Impossible : Science Fiction and the Utopian Imagination*, Peter Lang: 1-12.
Myers, Greg. 2003. Discourse studies of scientific popularization : questioning the boundaries. *Discourse Studies* Vol 5(2): 265–279.

N

Nafus, Dawn. Sherman, Jamie. 2014. This One Does Not Go Up To 11: The Quantified Self Movement as an Alternative Big Data Practice. *International Journal of Communication*, [S.l.], v. 8, p. 11, jun. 2014. ISSN 1932-8036. http://ijoc.org/index.php/ijoc/article/view/2170.
Narayanan, Srinivas. 1997. *Embodiment in language understanding: Sensory-motor representations for metaphoric reasoning about event descriptions*. Unpublished doctoral dissertation, University of California, Berkeley.
Neff, Gina. Nafus, Dawn. 2016. *Self-tracking*. Cambridge, MA: MIT Press.
Nike. 2015. *Nike+ Training Club* [online], Available at: http://www.nike.com/us/en_us/c/womens-training/apps/nike-training-club (13 June 2015)

O

Ortony, A. (ed.). (1993). *Metaphor and thought*, Cambridge: Cambridge University Press.
O'Halloran, Kieran. 2007. Critical discourse analysis and the corpus-informed interpretation of metaphor at the register level. Applied Linguistics, 28(1), pp.1-24.
O'Halloran, Kieran. 2017. Posthumanism and deconstructing arguments : corpora and digitally-driven critical analysis. Milton Park: Routledge.

P

Paganoni, Maria Cristina. 2019. *Framing Big Data : A Linguistic and Discursive Approach*. Palgrave Pivot, Springer Nature Switzerland AG.
Papacharissi, Zizi. 2009. The virtual geographies of social networks : A comparative analysis

of Facebook, LinkedIn, and A Small World. *New Media & Society*, 11(1–2), 199–220.

Papacharissi, Zizi. 2012.Without you, I'm nothing : Performances of the self on Twitter. *Inter- national Journal of Communication*, 6. http://ijoc.org/index.php/ijoc/article/view/1484

Philip, G., 2011. Chapter 4: Words in usual collocations: Delexicalisation and Chapter 5: Phrases in context: Relexicalisation, in Philip, G., 2011, Colouring meaning: Collocation and connotation in figurative language. John Benjamins Publishing.

Pishwa, Hanna. 2009. Linguistic structures as cues for social cognitive functions: Introduction. in Pishwa, H. (ed). Language and social cognition : expression of the social mind. Walter de Gruyter

Polanyi, M. 1972 *Personal knowledge: towards a post-critical philosophy* [1958], Chicago.

Pragglejaz Group, 2007. MIP: A method for identifying metaphorically used words in discourse. Metaphor and symbol, 22(1): 1-39.

Psillos, Stathis. 2009 (2002). *Causation and Explanation*. Stocksfield: Acumen.

Puschmann, Cornelius. 2013. Blogging. In Susan C. Herring, Dieter Stein, and Tuija Virtanen, eds., *Handbook of Pragmatics of Computer-Mediated Communication*. Berlin: Mouton de Gruyter, pp. 83–108.

Puschmann, Cornelius. Burgess, Jean. 2014. "Metaphors of Big Data," in International Journal of Communication 8 (2014): 1690–1709

Q

Quinn, Naomi. 1987. Convergent evidence for a cultural model of American marriage, in Holland, D. Quinn, N. (eds.) *Cultural models in language and thought*, Cambridge: Cambridge University Press

Quinn, Naomi. 1997. Research on shared task solutions, in Strauss, C. Quinn, N. A cognitive theory of cultural meaning, Cambridge: Cambridge University Press: 137-188.

QS Labs. 2014. *Quantified Self Public Health Symposium* [online], Available at: http://quantifiedself.com/symposium/Symposium-2014/ (24 May 2015)

R

Raz, J. (1986) *The morality of freedom*, Oxford.

Rettberg, Jill Walker. 2014. *Seeing Ourselves Through Technology: How We Use Selfies, Blogs and Wearable Devices to See and Shape Ourselves*. Palgrave Macmillan.

Récanati, François. 2001 What Is Said. *Synthese* (2001) 128: 75-91

Rickert, Thomas J. 2013. *Ambient rhetoric : the attunements of rhetorical being*. University of Pittsburgh Press.

Ritchie, L. David. 2006. Some crucial criticisms of conceptual metaphor theory, in *Context and connection in metaphor*, Hampshire, New York: Palgrave Macmillan: 40-55.

Robertson, James Oliver. 1980. *American myth, American reality*. New York: Hill & Wang.

Roden, David. 2013. "Book Review: Braidotti's Vital Posthumanism." *Humanity+ Magazine*. 18 November

Rosenberg, D. 2013. Data before the fact. In L. Gitelman (Ed.), *"Raw data" is an oxymoron,* Cambridge, MA: MIT Press: 15–40

Rotella, P. 2012. Is data the new oil? in Forbes. http://www.forbes.com/sites/perryrotella/2012/04/02/is-data-the-new-oil

Royce, J. (1969) The world and the individual [Gifford lectures, 1899], in McDermott, J. (ed.) *The basic writings of Josiah Royce, vol. 1*, Chicago.

S

Santayana, G. 1936. *Three philosophical poets: Lucretius, Dante, and Goethe* [1910], Vol. 6 of *The works of George Santayana*, New York.

Sargent, Lyman Tower. 2005. "Utopia Matters!" in Utopia matters: theory, politics, literature and the arts.

Sargisson, Lucy. 2012. Definitions, Debates and Conflicts: Utopianism, Anti-utopianism and Anti-Anti-Utopianism, in *Fool's gold? : utopianism in the twenty-first century,* Palgrave Macmillan UK: 6-40.

Sargisson, Lucy. 2012b. Sex and Sexual Identity, in *Fool's gold? : utopianism in the twenty-first century,* Palgrave Macmillan UK: 81-82.

Sargisson, L. (2014) 2014 Robert Chapman Lecture: "Utopianism in the twenty-first century" (released 8 October 2014) [podcast: video], Auckland: The University of Auckland, Available at: https://www.youtube.com/watch?v=HkndZUWp1Hk [Accessed 8 February 2015].

Satchell, C. 2008. "Cultural Theory and Real World Design – Dystopian and Utopian Outcomes." CHI 2008 Proceedings, April 5-10: 1593-1602.

Schler, Jonathan. Koppel, Moshe. Argamon, Shlomo. Pennebaker, James. 2006. Effects of Age and Gender on Blogging. *Proceedings of 2006 AAAI Spring Symposium on Computational Approaches for Analyzing Weblogs*. http://u.cs.biu.ac.il/~koppel/

BlogCorpus.htm.

Schlick, Moritz. 1932. “Causation in Everyday Life and in Recent Science”. In Philosophical Papers, Volume II, H. L. Mudler & B. F. B. van de Velde-Schlick (eds), 238–58. Dordrecht: D. Reidel, 1979.

Schneier, B. 2014. *Data and Goliath:The hidden battles to collect your data and control your world.* NewYork:W.W. Norton.

Searle, John R. 1983. The Background, in *Intentionality : an essay in the philosophy of mind*, Cambridge: Cambridge University Press: 141-159.

Skinner, B.F. (1969) *Contingencies of reinforcement: a theoretical analysis*, New York.

Skinner, B.F. (1971) *Beyond freedom and dignity*, New York.

Sointu, E., 2005. The rise of an ideal: tracing changing discourses of wellbeing. The Sociological Review, 53(2), pp.255-274.

Sperber, D. (1996). *Explaining Culture: A Naturalistic Approach*. Oxford: Blackwell.

Stanke, Bob. 2014. online. Where My 90 Hours of Mobile Phone Screen Time In September Went. *Bob Stanke 21 October 2014* [online: weblog]. http://www.bobstanke.com/blog/2014/10/21/where-my-90-hours-of-mobile-phone-screen-time-in-september-went (2 June 2015)

Steen, Gerard J. 1995. From linguistic to conceptual metaphor in five steps, in Gibbs, R. Steen, G. J. (eds.) *Metaphor in Cognitive Linguistics: Selected papers from the 5th International Cognitive Linguistics Conference, Amsterdam, 1997*, Amsterdam: John Benjamins B.V.: 57-77.

Sterling, B. 2009. “Design Fiction.” *interactions*, Vol 16, No. 3, May + June 2009: 20-24.

Strauss, Claudia. Quinn, Naomi. 1997. *A cognitive theory of cultural meaning*. Cambridge University Press.

Suvin, Darko. 2003. Theses on Dystopia 2001, in Baccolini, R. Moylan, T. (eds.) Dark horizons : science fiction and the dystopian imagination, New York : Routledge: 187-201.

Sweetser, E. E. 1987. The Definition Of Lie : An Examination Of The Folk Models Underlying A Semantic Prototype, in Holland, D. Quinn, N. (eds.) *Cultural models in language and thought*, Cambridge: Cambridge University Press.

T

Taylor, Charles. 1976. Responsibility for self, in Rorty, A.O. (ed.) *The identities of persons*,

Berkeley.

Taylor, Charles. 1985. *Human agency and language: philosophical papers, vol. 1*, Cambridge.

Till, Christopher. 2006. “An Introduction to the Quantified Self Research Network’s Inaugural Meeting”. https://christopherharpertill.wordpress.com/2013/09/16/an-introduction-to-the-quantified-self-research-networks-inaugural-meeting/ (26 May 2015).

Turkle, Sherry. 1995. *Life on the screen: identity in the age of the Internet*, New York: Simon & Schuster.

Turkle, Sherry. 2011. *Alone together*. New York: Basic Books.

Turner, Fred. 2009. Burning Man at Google: A Cultural Infrastructure for New Media Production. *New Media & Society*, vol. 11, no. 1–2, Feb: 73–94.

Turow, Joseph. 2011. *The daily you.* New Haven, CT:Yale University Press.

Turow, Jospeh. 2017. *The aisles have eyes: How retailers track your shopping, strip your privacy, and define your power*. New Haven, CT:Yale University Press.

U

University of Leeds 2013 *Quantified Self and Self-Tracking: Research Network Meeting* [online], Available at: http://thesp.leeds.ac.uk/2013/09/quantified-self-and-self-tracking-research-network-meeting/ (26 May 2015)

Uselding, P. 1981. Measuring techniques and manufacturing practice. in O. Mayr and R. Post (eds.), *Yankee Enterprise*. Washington, D.C. : Smithsonian Institute Press: 103-126

V

Van de Koot, Hans. 2006. Idealization, in Brown, K. (ed.) *Encyclopedia of Language and Linguistics 2nd Edition*, Elsevier Science: 482.

Van den Boomen, Marianne. 2014. *Transcoding the Digital: How Metaphors Matter in New Media*. Amsterdam: Institute of Network Cultures

Van Dijck, José. 1998. *Imagenation : Popular Images of Genetics*. Palgrave Macmillan UK.

Van Dijck, José. 2013. ‘You have one identity’: Performing the self on Facebook and LinkedIn. *Media, Culture & Society*, 35(2), 199–215.

Van Dijk, Teun A. 1998. Opinions and ideologies in the press. In A. Bell & P. Garrett (Eds.), *Approaches to media discourse,* Oxford, UK: Blackwell Publishers: 21–63.

VU Amsterdam Metaphor Corpus Online. 2016. Documentation, Accessed on 17 Apr 2016, http://www.vismet.org/metcor/documentation/home.html.

W

Watson, Sara M. online. Data is the New "___" : Sara M Watson on the Industrial Metaphors of Big Data. In *Discussion, DIS Magazine*. 17 September 2019. http://dismagazine.com/discussion/73298/sara-m-watson-metaphors-of-big-data/

Watson, Sara M. 2016. "Toward a Constructive Technology Criticism." Tow Center for Digital Journalism White Papers. New York: Columbia University. https:// doi.org/10.7916/D86401Z7.

Werth, Paul. 1999. *Text Worlds: Representing Conceptual Space in Discourse*. London: Longman.

White, Andrew. 2014. From the private to the public: online identity. *Digital media and society: transforming economics, politics and social practices*, Basingstoke: Palgrave Macmillan. pp. 26-42.

Whitson, Jennifer R. 2013 Gaming the Quantified Self. *Special Issue on Surveillance Futures*. Surveillance & Society, 11(1/2).

Wikipedia (2015) Wired *(magazine)* [online], last modified on 24 May 2015, at 03:01, Available at: https://en.wikipedia.org/wiki/Wired_(magazine) [Accessed 30 May 2015].

Wolf, Gary. 2010. "FAQ – How To Start Your Own QS Show&Tell". http://quantifiedself.com/2010/02/organizing-a-qs-showandtell/ (5 June 2015).

Wolf, Gary. 2011. What is the Quantified Self?, *Quantified Self 3 March 2011* [online: weblog], Available at: http://quantifiedself.com/2011/03/what-is-the-quantified-self/ (9 June 2015)

Wutich, Amber. Ryan, Gery. Bernard, H Russell. 2015. Text Analysis, in Bernard, HR. Gravlee, C. C. (eds.) *Handbook of methods in cultural anthropology Second edition*, London: Rowman & Littlefield.

X

Xu, Jiajin. Liang, Maocheng. 2013. A tale of two C's: Comparing English varieties with Crown and CLOB (The 2009 Brown family corpora). *ICAME Journal* 37: 175–183. http://icame.uib.no/ij37/Pages_175-184.pdf (12 February 2014)

Z

Zerubavel, E. 1982. The standardization of time : a sociohistorical perspective. *American Sociological Review* 88 (l) :1-29.

Zawidzki, Tadeusz W. 2008. “The function of folk psychology: mind reading or mind shaping?,” in Philosophical Explorations, 11:3, 193-210, DOI: 10.1080/13869790802239235

Zinken, Jörg. Hellsten, Iina. Nerlich, Brigitte. 2008. ‘Discourse Metaphors’. In *Body, Language and Mind: Sociocultural Situatedness*, 363-86. Berlin: Mouton de Gruyter.