Looking at our data—perspectives from mindfulness apps and Quantified Self as a daily practice

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***Abstract*—Mindfulness apps offer an interesting object of study if one wishes to understand how a daily awareness type of practice can result in positive changes in an individual. Apps offer a concrete object for studying something as elusive as a daily practice and its consequences. When mindfulness practice is contrasted with daily self-measurement using various tools, the similarities help us to understand more clearly why also self-measurement can lead to positive changes in behavior and even to improvements in health. However, there are also notable differences. In particular, the role of acceptance towards any observations is currently little understood among QS, while it is an essential component in mindfulness practices. We are led to ask whether acceptance should be adopted as an conscious design principle also in QS.**

I. Introduction

While Quantified Self apps gain public interest and lots of users, they provide a new kind of information flood, namely information flood about ourselves. How should we approach this new kind of information? Are we able to benefit from it? Is it usable, useful? How do we make meaning out of it? Are there risks, i.e., can it in some circumstances even be harmful?

These are essentially questions not about data, or about its presentation. They are questions about human mind. There are questions that relate to human cognition, such as how to visualize a bit of data to make it understandable and meaningful. Little attention, however, has been paid to what humans are supposed and able to do with the data. The underlying assumption seems to be that after getting more data, the individual starts to optimize or control their behavior for the better, and thus becomes healthier.

Buddhist practice of meditation, or its westernized counterpart called mindfulness by Jon Kabat-Zinn [Kabat-Zinn, 1994], on the other hand, deals with how to handle—in the present—our sensations, emotions and recurring patterns of thought. Mindfulness Based Stress Reduction (MBSR) entails a systematic procedure for developing "enhanced awareness of moment-to-moment experience of perceptible mental processes" [Grossman et al., 2004] and is shown to help in a diverse set of non-clinical and clinical problems. Mindfulness programs for schools seem to hold promise for improving cognitive performance and resilience to stress [Zenner et al., 2014]. A modern application of these practices is currently seen in the app stores (e.g. 305 apps in Google Play with the keyword mindfulness in Nov 2013).

With a research background in information sciences and language modeling, being a practitioner of meditation for over 15 years, and having an interest in Quantified Self as a daily practice, it made a great deal of sense for me to take mindfulness apps as an object of study. In the following, I will observe what the design of popular mindfulness apps tells us about the practice, and then look at Quantified Self as a kind of mindfulness practice.

II. Studying mindfulness trough the apps lense

When studying at a practice which is performed using certain tools one may look at how these tools construe their user: How the user is viewed or described by the tool, what kind of interactions are offered and so on. A tool, the functions it offers, and the ways in which it presents itself, can be viewed as a representation of various practices that have become established in a community or sub-culture. It can also be seen to contain a representation of the user, i.e., of the user's preferences, needs, and so on. If a tool is accepted by its users, then one might conclude that the tool has succeeded in construing its representation of the user.

Madeleine Akrich [Akrich, 1992] describes how innovators consider their users in designing tools: The innovators are from the very start constantly interested in their future users. They construct many different representations of these users, and objectify these representations in technical choices. Users then go on to either accept the representation offered, or reject it by not utilizing the innovation. Thus it can be argued that one valid research approach for studying the users of apps is by studying the user representations present in the particularly popular or well-accepted apps themselves.

Innovations may be rejected by their users because they fail to correctly represent the users circumstances, needs and goals. In contrast, the innovations accepted by large numbers of people are likely constructing a more correct representation of the user. It seems therefore evident that if we wish to study the practice of mindfulness through mindfulness apps, one should pick the mindfulness apps with strongest evidence of

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being accepted by their users. When studying the most popular mindfulness apps, we look mainly at the textual descriptions, and from them try to observe the following: For what kind of user need is this offered as a solution, and what benefits are proposed? Which means or functions does the app employ to induce the promised results with the user?

A. *Data collection regarding mobile mindfulness apps*

The data was collected from Android App Store in late Fall of 2013, where there was a total of 305 apps with the keyword mindfulness. When looking at how the apps were categorized, mindfulness is mostly portrayed as related to Health and Fitness(40% of the apps and 75% of their total downloads). The runner-up is Lifestyle (27% of apps and 11% of downloads), followed by a steadily dropping tail of categories including Books (5% of apps and 2% of downloads) and Music and Sound (2% of apps and 3% of downloads). The five most popular apps were installed between $100,000 - -500,000$ times, with average review scores between $3,6 - -4,6$. Out of the 305 apps, nearly half, 140 were installed less than 50 times.

What is a good measure of acceptance of an app? It turns out that acceptance of an app is indicated in three ways in the app store: In the number of downloads, in the number of reviews and in the grade given in the reviews. After studying the correlation between review grade, number of downloads and number of reviews, it appears that review grade alone is not a good measure of acceptance. Review grades tend to be considerably high for very seldomly downloaded apps—possibly because first downloaders are the developers and their friends. A more stable measure across different download numbers was found to be the number of downloads combined with the number of reviews. If an app has a large number of both downloads and reviews (with reasonably good grade) these are a rather trustworthy sign of acceptance of the app by a large user base consisting of independent users.

In order to find apps that best reflect a view of mindfulness that is also verified by acceptance from the users, 20 most popular apps were selected for closer study. While all good apps are not necessarily popular (for example, apps that have just emerged to the market), popular apps are more likely to be good and accepted by their users than non-popular apps. In short, popularity of an app means that the users have already adopted the technology and found a use for it in their lives.

All the 305 apps were ordered into popularity order, first based on the download category (an interval). Within the interval, apps were then ordered based on the number of reviews users had given for the app. The 20 best were selected for closer analysis. Four were excluded due to too little textual information available. The remaining 16 applications are listed in Table I. We then looked at particularly two aspects: (1) What do the apps promise as results of the use, and (2) what are the functions of the app, i.e. the means by which it promises its results. Moreover, we installed one of the most promising apps to experience their qualities hands on.

B. *Results*

The apps promised a number of outcomes from using the app. Promises related generally to relaxation, calming the mind, finding peace of mind and tranquility. The use of the apps would also lead to better concentration, being able to focus better, gaining balance and recharging. One app (Yoga Nidra) even promised relief from physical pain, and a few promised inner guidance or inner knowledge. Improvements in quality of life and quality of sleep were also regularly described. In addition, there were several promises regarding what qualities would be reduced as an outcome of using the app. These included decrease in panic attacks, anxiety, stress, depression, pain, insomnia and even physical illness. The outcomes promimsed by the apps are summarized in Figure 1.

TABLE I. MINDFULNESS APPS STUDIED

Name	Download	Score	Reviews	Category
1 Insight Timer Free	100 000	4,5	1626	Health
2 Mindfulness Bell	100 000	4,6	1242	Health
3 Relax Lite: Stress Relief	100 000	3,9	446	Health
4 Qi Gong Meditation Relax.	100 000	4,3	423	Health
5 Yoga Nidra Meditation(Free)	100 000	3,6	211	Health
6 Flow	50 000	3,5	321	Lifestyle
7 Headspace (on-the-go)	50 000	3,7	315	Health
8 Stress Check	50 000	3,6	104	Health
9 Conscious	10 000	4,6	378	Lifestyle
10 SATiFY Mindfulness Medit.	10 000	4,1	174	Health
11 Law Of Attraction Hypnosis	10 000	4,4	133	Lifestyle
12 My Diet Tracker Photo Jour.	10 000	4,1	88	Health
13 Zen Live -Wallpaper	10 000	3,5	79	Modified
14 2 Minutes	10 000	3,6	77	Health
15 DREAM-e: Dream Therapy	10 000	3,9	66	Medicine
16 Room to Breathe Medit.	10 000	4,4	59	Lifestyle

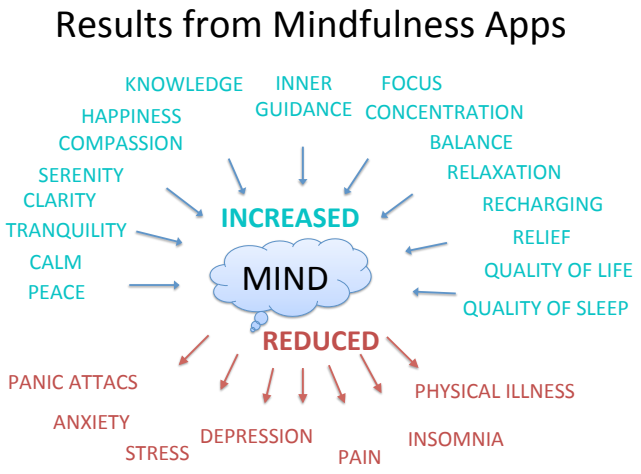

Fig. 1. Results from mindfulness app use according to the app descriptions

Research over the past years indicates that mindfulness practice, typically taught and led by trained professionals, can indeed obtain most of the results promised. However, one may wonder, in what ways could the apps help obtain similar results? Moreover, while a practice session led by an expert may not be easily described, when creating a technological app, one must necessarily become very conscious of what are the means for obtaining the results. When looking at the apps and how they functioned, they generally applied the following methods:

1) Setting up a certain atmosphere (e.g. Zen live wallpaper, Mindfulness Bell)
2) Managing time during the practice, or reminding to practice (e.g. Mindfulness Bell, Insight timer)
3) Teaching or guiding the practice itself (e.g. Headspace, RelaxLite, Yoga Nidra, Conscious)
4) Assessing, profiling, tracking or measuring either properties of the user, or some measure of progress (e.g. Conscious, Satify, Diet tracker, Stress check)

Some of the apps only utilized one or two means, while leaving part of the practice to the user's responsibility alone. The more comprehensive ones (e.g. Headspace) offered a full service to their user. From the point of view of an experienced practitioner, the functions 1 and 2 seemed sufficient, whereas for someone just starting would need also the function 3 and would perhaps benefit of and be motivated by function 4 as well.

Perhaps surprisingly, the core of mindfulness practice itself is not fully described in the app descriptions. Rather, it is incorporated into the apps. The core practice is summarized in [Greater Good, 2014] as

1) Mindfulness means maintaining a moment-by-moment awareness of our thoughts, feelings, bodily sensations, and surrounding environment. (Awareness)
2) Mindfulness also involves acceptance, meaning that we pay attention to our thoughts and feelings without judging themwithout believing, for instance, that theres a right or wrong way to think or feel in a given moment. (Acceptance)

The first part synthesizes the practice, and the second part describes how precisely to carry out the practice. Both parts are considered essential for success. While the apps generally were able to describe the first part in their textual descriptions, and typically also incorporate it into the design of the app, they generally did not state the second principle.

It is this second principle that is perhaps neither understood in the discussions regarding Quantified Self, or in particular regarding how to present data to individuals in order to help them change their life for the better.

III. Quantified Self viewed as a mindfulness practice

Quantified Self can be described as a practice where one measures, journals or records aspects of one's daily life over time. The activity may require active input, like when taking picture of every meal eaten, or writing up own feelings or experiences, or it may be more passive, such as having a mobile app that runs on the background measuring aspects of one's life such a steps taken. Of importance is the possibility to look at one's data every now and then in the context of one's own life. The rise of the phenomenon of self-tracking is recorded for example in [Nafus and Sherman, 2013]. Quantified self as a practice has been analyzed by [Pantzar and Ruckentein, 2013], who identified the following four principles that affect this kind of a data-driven life: Need for transparency, wish to optimize life, getting feedback of one's actions, and biohacking.

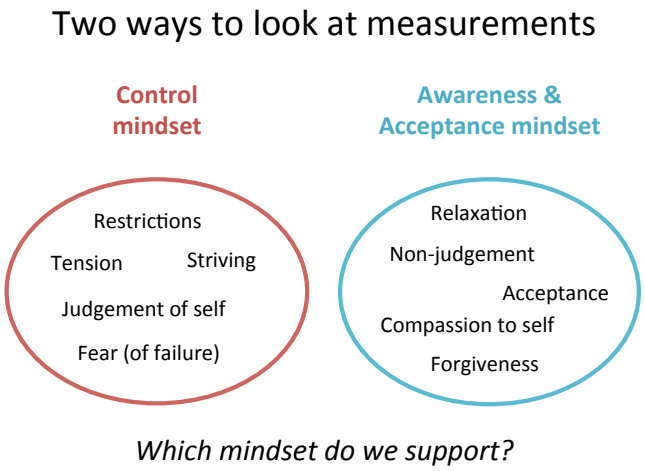

Fig. 2. Different mindsets that can be used when looking at one's own data.

Quantified Self –type continuous self-tracking resembles in some ways mindfulness practice. Paying attention daily to one's own measurements in the context of one's everyday life helps one to become aware of one's own habits as well as their measurable effects on well-being, happiness, or health (Awareness). The shared belief seems to be that measuring leads also to change of behavior. For example, studies have shown that people who keep diaries tend to lose substantially more weight than those who dont, claims Diet Tracker. The idea is that by using QS techniques to observe your habits, you become aware of them and their effect, which leads to changing one's habits.

Interestingly, increased awareness of what happens in the present moment is at the core also in mindfulness practice. This is how far the similarity reaches, however. Related to Quantified Self there is seldomly, however, talk about what stance to take with the data we observe. Should we accept the data? Or should we be judgemental about it, feeling very bad about how badly we performed or progressed? Should we then try to control ourselves better in the future? Since QS does not take a conscious design stance in this matter, it is pretty much left either to the user, or to the designer of the particular app, or to the wellness coaches, personal trainers and nutritionists to make their best guess.

The efficacy of mindfulness practice and the strong evidence from research, however, point to the conclusion that what should be added to QS and similar efforts is the Acceptance principle. That is, the power of acceptance as a way to look at ourselves, and our data, is what leads to the powerful transformation and good results in mindfulness. Should it also be added as a design principle in Quantified Self, in personalized medicine and related efforts when presenting health data to the users? The overwhelming and constantly growing research findings regarding the benefits of mindfulness would seem to suggest so.

The typical counterargument is, if I accept my weight, smoking or stress, then how is it ever going to change? The answer from mindfulness training is that what is needed is accepting how it is now, in the present moment. And staying

only in the present moment is actually enough. If we accept our weight or our stress level as it is now, this creates a space for its so far hidden causes to emerge into awareness. Acceptance and compassion towards the hidden causes, in turn, creates a deep change in the root level of the matter. By addressing the roots, the matter is slowly resolved, and change occurs by its own force. No internal or external control structures, no nudging, no carrots or sticks are then needed for life change to occur.

Thus, to achieve the best results from QS practice we should in fact incorporate lessons that have been learned from mindfulness practices. A key realization, that could be incorporated into any applications that show individuals their own data, is the support towards acceptance and compassion. The support can be implemented either by coaches or by design of the application. The best mindfulness apps show the way, i.e., they show how to incorporate acceptance and compassion training towards observations regarding our own mind. Similar principles could be applied with any data that we get from our daily lives.

IV. Conclusion

One might think that mindfulness practice and apps are a far reach from each other. The mindfulness practice in itself is a very immaterial, non-technological, and internal to the mind. To see it change into something as external as to be created and enabled by a technological application is thus rather interesting. Moreover, there are evident cultural barriers, such as barriers related to foreign concepts, belief systems, associated traditions, and material objects that are foreign to many western users. How does an eastern tradition that has for long been transmitted in secluded monasteries in the East turn into something as technologized and every-day as to appear in swarms in western app store, to be used during a bus drive from home to work?

Another interesting contrast is highlighted by comparing mindfulness apps to the measurement approach evident in Quantified Self movement. In the latter, the main function of the apps is to measure something about the users bodily state, activities, location, or environment, and to regularly bring this into the awareness of the user. As a result the user gains a new view to themselves. With mindfulness apps the objective is also increased awareness regarding oneself, but the methods are in fact opposite. Instead of external measurements the user is led to pay attention to internal measurements. In doing so, the user over time learns new skills. Internal perceptive skills are increased since attention is directed to bodily and mental signals that are at first nearly imperceptible or sub-conscious. Moreover, internal awareness of states of the self leads to changes in behaviour just as external measurements. The interesting contrast is that while Quantified Self apps may become like techno-attachments to the body, possibly even making one dependent on them, mindfulness apps make their user more free. They teach their users to be mindful eventually regardless of the app, and therefore might render even themselves useless. Naturally this is likely to be how some QS apps work as well—as temporary interventions after which something has been learned and then the external measurement is needed no longer.

My initial prejudice when starting this research on the connection of mindfulness and QS was that measurement using external devices might reduce one's attention to the internal experiences, and therefore actually diminish learning about oneself. I am happy to admit that my preconceptions were not confirmed, but instead changed while immersing in the QS community, hearing experiences of the use of such devices, and while trying more of them myself. I now find that many of the benefits that apply to mindfulness also apply to quantified self measurements. However, while studying the mindfulness apps and thingking about the differences in these practices I also found one crucial aspect of mindfulness practice which I have not seen discussed in relation to quantified self–namely the concept of acceptance. While acceptance is likely to be ingrained as a point of view in some of the QS apps and devices, in my view it needs to become an aware and conscious design choice in order for QS to become a safer pursuit for all.

As it stands, I posit that the most interesting difference between mindfulness and QS is in how any mindfulness practice, and the mindfulness apps likewise, incorporate the atmosphere and attitude of acceptance towards oneself into the moment-by-moment practice. It might be well advised to consciously incorporate similar attitude also to QS-type self-measurement protocols in order to obtain full benefit in terms of increased health, well-being and happiness.

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