Introducing digital wellness

Bringing cyberpsychological balance to healthcare and information technology

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Abstract—**Information technology's potential for beneficial effect in healthcare is considerable, but has yet to be realised. While definitions of concepts in this area vary, they are largely uniform in their positivity. In this paper, we outline some psychological issues with the use of technology in healthcare, including e-health, m-health, pervasive health, telehealth, and related initiatives. Fundamentally, we urge a more *cyberpsychological* approach to the use of technology in healthcare. By illustrating with regard to the phenomenon of *cyberchondria* (anxiety induced by health related internet search behaviour), we explain possible downsides of e-health. Furthermore, we show how this necessitates the need for a measure of *digital wellness* – consideration of how a person relates both physically and mentally, to information technology. It is therefore recommended that eHealth researchers and practitioners consider a number of cyberpsychological concepts and related psychometric scales when they progress new initiatives.**

Keywords—e-health; digital wellness; cyberchondria; privacy; technostress

I. INTRODUCTION

As we begin to live in an increasingly technologically mediated society, industrial and occupational sectors look set to be revolutionised, and healthcare is no different. It seems quite certain that the provision of public medicine, from access to records, patient education, analysis of data, can be vastly improved with the introduction of electronic, networked, and mobile applications. But to actually accomplish these goals, we do not only have extensive engineering problems to overcome, but significant psychological, social, and cultural barriers to negotiate. The fuzzy problems of healthcare technology – not just building effective applications, but getting people to use them, and like using them – are often left out of e-health discourse, and that is what this paper is trying to begin a discourse on.

Human beings, their biology aside, are complicated and unpredictable nodes of information, emotion, and individuality. As we become integrated more with information systems of healthcare and lifestyle, our idiosyncrasies will become evermore apparent. At the intersection of technology and psychology – cyberpsychology – there is yet a significant body of theoretical and practical work to be carried out to ensure that potential of technology is met. We cannot simply assume a 'one size fits all' approach in e-health, as this runs the risk, among other things, of a substantial waste of resources and research funding.

To put it bluntly, almost every jurisdiction in the Western world has evidence of problems in healthcare provision. While the idea of technological innovation to solve those problems, we should also note that equally, in recent years nearly every one of those countries has also suffered a moderate to major leak of patient data. More to the point, as reports of cyber intrusions and exfiltration of data seem to grow from one week to the next, it does not seem likely that this trend will change.

Consequently, as we move towards greater use of e-health and m-health, it is worth bearing in mind the general mood of fear and apprehension that the participants of such systems may not be immediately amenable to technological innovation. Crucially, the point of a psychological analysis is to understand which sorts of people are more or less amenable to e-health, and why. In so doing, and by incorporating the elements of digital wellness mentioned below into research practice, we hope to both improve the success of e-health initiatives and ameliorate participants' experiences of them.

This paper should be read as proposing a new explanatory platform for public healthcare, as well as a general survey of current directions in e-health. It incorporates three main areas of discussion: a background to the debates on the definitional issues on e-health; ongoing issues around the adoption of e-health (age divide, privacy, security) and an introduction to the concept of digital wellness as a psychometric mediator between e-health, health informatics, and social science.

II. E-HEALTH IN THEORY AND PRACTICE

A. Debates around definition

1) There has been significant debate about what e-health is for well over decade [1], [2]. Moreover, there has

also been a number of attempts to develop a taxonomy of telemedicine for some time [3], [4]. This is in addition claims of a lack of theory-driven design of e-Health applications [5]. Other researchers have said that the 'rapid shifts in the informational landscape' necessitate revision of the concept of e-health literacy [6]. As such, it is hard to avoid the conclusion that the theory of information technology in healthcare is still in its infancy.

Though one review of the definitional literature notes that 'wellness' is only recorded five times, [7] arguably that is no reason to overlook the concept just yet. At the same time, while 'wellness' has been around for some time longer than e-health or information technology, and there are still debates around its definition, in this paper we read the term as per "a multidimensional state of being describing the existence of positive health in an individual as exemplified by quality of life and a sense of well-being" [8].

More to the point, given the same review [7] noted that none of the recorded definitions suggested that e-health could have any adverse, harmful, or disadvantageous effects suggests that critical scholarship in this field is profoundly wanting. As detailed below, there has been considerable research demonstrating the ongoing negative effects of technology on human health and wellbeing, and this is something which e-health practitioners must be cognisant of, and more importantly need to address.

B. The promise of e-health

It is now something of a cliché to remark upon the rapid growth and profound effect that information communication technology could possibly have on healthcare provision. Yet at the same time, as we move towards a more technologically augmented smart environments (smart homes, smart medical institutions, smart cities), it is important that we consider user acceptance of these services, including e-health and m-health, in a realistic context [9]. The long awaited phenomenon of the internet of things [10] and its use in health contexts, such as ambient assisted living [11], seems closer in 2015 than ever before. In that light, agency [12] and security [13] are critical issues with internet of things, especially so with health technology.

Given that there exists widespread public concern over problematic aspects of technology adoption generally – cyberbullying, privacy, information security, surveillance, child abuse material etc. – user acceptance of advanced and complex e-health services may generate similar issues. In this paper, the concept of *digital wellness* as a discursive tool is proposed for both allaying public fears around the widespread adoption of smart health services, but also as a possible future framework for assessing individual patients' technological lifestyle patterns.

Arguably while e-health has huge potential, this has not yet been realised [14]. As previous researchers have stated, 'many theoretically elegant interfaces … have failed in real-world settings' [15]. As such, 'existing literature on human computer interaction should be incorporated when developing patient-centred care' [15] – a call with which the authors would entirely agree, and in fact would go further in this regard. Patient-centred care is intrinsically interdisciplinary [16] – a scholarly landscape with which cyberpsychologists are intimately familiar – and as such, researchers and practitioners in e-Health need to open their eyes to the potential utility of cyberpsychological research.

C. Issues around uptake

When we talk about a cyberpsychological approach to e-health, what we are fundamentally pointing out is a critical approach to the concept of the 'user' [17]. Human beings differ from each other in their technological preferences across a variety of factors, but the most obvious one is age.

Given that technology in all its guises is often seen as a 'young person's thing', it is no surprise that many of the major issues around the delivery and uptake of e-health (and m-health) concern older generations. Recent research concerning smart environments, proposes a 'user-centric approach' but notes that this requires 'requires considering the heterogeneous aspect of the existing communication platforms and services'[18].

Critically, older generations as a population are not homogeneous and this diversity is borne out in research with e-health. It has been found that of those aged 65-70, those with higher education and/or living with a partner were more likely to use ICT [19], and were more likely to self-report as ''physically and emotionally independent'' and having a ''positive outlook''. Additionally, the same research reported that non-users in that age group said that their ICT activities did not change across time and that they felt ''intimidated'' and ''anxious'' with technology [7].

Such fears are understandable, and need to be considered alongside the privacy considerations which have been argued in relation to paediatric e-health [20]. While there has been some interesting structural equation modelling research regarding the issues affecting accurate information disclosure [21], we concur with those researchers who maintain that more research is needed, particularly around "the implications for privacy of their personal data and the possible effects on the doctor patient relationship" [22].

While researchers have pointed out that improving the internet knowledge and e-health literacy of the older population, and thereby increasing their likelihood of searching for health information might encourage better health behaviours [23], this is not without its problems. In the first instance, there is a need for awareness of the digital divide in older adults, and its potential to disempower as well as empower in this particular population [24]. While e-health literacy has a positive direct effect on informational e-health behaviours in a college student population [25], it would be a mistake to simply extrapolate from that population to another.

Further afield, while we might assume that privacy and trust in information technology usage would be less of a concern for younger than older users, research has shown this not to be the case. A survey of 165 people, aged

between 17-95, found that trust and privacy were central requirements for the use of medical technology within homes – concerns which were largely consistent across both gender and age [26]. Additional research on intention to use mobile health services has included the related concept of threat appraisals within a unified model of health technology acceptance, along with performance expectancy, effort expectancy, social influence, facilitating conditions [27].

Research has also shown, in a rural setting, that while cultural, organizational and other factors are often omitted in studies of health information technology, these issues are reported as being important to many of the stakeholders in such implementations [28]. Moreover, transparency in reporting, pragmacy in design and general appreciation of context is important where e-health research is intended to translate public policy into practice [29]. As e-health and information technology move out of the urbanized West, these contextual and cultural factors will become increasingly important. Further research is critical in view of the fact that so much psychological research is W.E.I.R.D. [30] (based on western, educated, industrialized, rich, and democratic population samples).

III.   E-HEALTH IN THE WILD - CYBERCHONDRIA

An important aspect of taking a more cyberpsychological approach to e-health is to explore the subtle differences in the culture and traditions of the two sectors at work, namely healthcare versus information technology. The former is generally a scientific and empirical tradition in élite professions, whereas the latter is more of an entrepreneurial and engineering tradition with more of a populist emphasis. These broad distinctions are important in assessing the likely effects of e-health in practice.

In that light, it is noteworthy that the majority of empirical health ICT research usually comprises of controlled studies, limited initiatives, or specific projects. In contrast, what is often omitted is health-related use of ICT by the general public 'in the wild'. Given that much information technology is a mass market product designed to be able to be used by an average member of the public without any training, it is inevitably used for healthcare purposes. This is most clearly apparent in the exemplar of the patient who arrives at their doctor's surgery with an armful of Google search printouts [31], [32].

In addition to the empowerment issue noted above, a review of internet health studies and their effects on the clinician/patient relationship concluded that such websites can, amongst other things, replace face-to-face consultations; supplement existing forms of care; disturb relations; and/or force or demand more intense patient participation [33].

Consequently, there is support in the empirical research literature for the concept of *cyberchondria*, or 'unfounded escalation of concerns about common symptomatology,

based on the review of search results and literature on the Web' [34]–[36]. Additionally, considerable research has been carried out in developing psychometric scales on this concept [37]–[39], as well as conceptualising its associations [40], which include anxiety sensitivity and intolerance of uncertainty. Moreover, there is also some evidence to suggest the existence of *cyberchondria by proxy* – anxiety induced when conducting health-related search for others [41]. It is not beyond the realms of possibility to therefore hypothesize a general anxiety around the use of technology in healthcare, which may underlie all forms of e-health uptake issues.

Consequently, as we inevitably move towards the roll-out of pervasive health and internet of things, we need to start asking more serious questions about the potential of these technologies for negative consequences. We cannot simply assume that adding technology to healthcare will have a positive effect on a patient's wellbeing.

IV.   INTRODUCING DIGITAL WELLNESS

We define digital wellness as incorporating all aspects of a person's wellbeing with regard to information technologies, including but not limited to: their propensity to search for health related information online, their online security and privacy cognitions, attitudes and behaviours, their use of and level of attachment to their devices, their impulsivity in responding to device notifications, their multitasking patterns, cross platform and device behaviours, their screen time duration, their posture and so on. In sum, a person's digital wellness signifies how healthily, both physically and mentally, they relate to digital technology. Unlike extant definitions of e-health which are overwhelmingly positive [5], we believe 'everything in moderation' is a more realistic approach to technology usage.

We hypothesize that, either separately or in concert, these factors will have a significant role in the uptake and success of a wide variety of e-health initiatives. In addition to the scales mentioned above regarding cyberchondria, we suggest that researchers and practitioners consider the following measures in relation to the uptake and continuance of e-health initiatives. Given that wellness is conceptualised as multidimensional [8], we propose that digital wellness is also multidimensional, with physiological, behavioural, and psychological elements.

A. Elements of digital wellness

The following psychometric scales have proved illuminating in the study of cyberpsychological behaviour and are hypothesised to be useful tools. While the proposed digital wellness model is currently aspirational, is envisaged that readers will appreciate the utility of the concepts, research, and measures outlined below.

1) Physiological
    a) Screen time

Beginning from the most basic, physiological aspect of technology usage, e-health practitioners should consider the factor of duration of time spent by patients in front of a screen, handheld or desktop. For some time now, it has been recognised by established medical opinion that excessive time spent in front of computer, tablet, smartphone or television screens is deleterious for human health [42] and specifically for younger population [43] this is being reflected in the development of scales such as the Motivation to Limit Screen-time Questionnaire [44].

b) Technostress

Furthermore, we need to consider the concept of technostress [45], the phenomenon of end users experiencing stress due to information and communication overload. Interestingly, in the context of telemedicine, research has shown some support for stress occurring when there is a mismatch between individuals' characteristics and environmental settings [46]. Additionally, and unsurprisingly, this has been argued as present in health related information search online also [47], and hence cyberchondria.

2) Behavioural
a) Problematic use of internet

It is of critical importance in a wellness context to understand how participants feel about their context. In a technological setting, a good example of this is the online cognition scale [48]. While research on 'internet addiction' is now nearly twenty years old [49], and there now exists a variety of psychometric measures around related behaviours [50], we are still a long way from understanding what exactly draws users to the internet, and what they find 'addictive'. Similarly, research on excessive attachment to portable devices, such as the problematic use of mobile phone scale is beginning to emerge [51].

b) Media multi-tasking

It has now been shown that there are cognitive differences between those ICT users who prefer to use one device or interface at a time, and those who like to juggle many at once [52]. As such, when designing interfaces, developers need to be cognisant of the fact that some users are likely to be switching between screens (more than likely younger users) and other users (probably older users) will be focussing.

3) Psychological
a) Online privacy

Privacy is an ongoing issue with regard to the public participation in a variety of information communication technologies, but should be acutely present in discussions of e-health. While privacy and trust are of regular investigation in social media research, with scales adapted for that particular purpose [53], it is by no means easy to find equivalents in e-health research. Notably, the recently-published e-Health Impact Questionnaire [54] contains no references to privacy or security, while the afore-mentioned questionnaire designed for use on the 'social web' does contain the item 'Are you concerned about who might access your medical records electronically?' [38].

b) Online disinhibition

First hypothesised by noted cyberpsychologist John Suler over a decade ago, online disinhibition [55] is now beginning to see serious empirical attention [56]–[58]. This psychological effect refers to the tendency for users of the internet to self-disclose or act out more frequently or intensely than they would in person [55]. This has clear implications for any form of online health application, where patients are expected to interact, especially those already under stress or suffering from health anxiety.

V. IN CONCLUSION

While this paper is intrinsically critical, argumentative, and aspirational, we hope that it will give practitioners and researchers in e-health some food for thought. The issue of cyberchondria demonstrates that there are very real and tangible negative side effects to delivering healthcare information via the internet, which were presumably not anticipated by those responsible for putting it there in the first place. Likewise, in spite of the overwhelmingly positive perspective in e-health literature, researchers need to be mindful of the possibility that using ICT in whatever way for healthcare purposes may have negative psychological effects. In that light, we propose that practitioners consider and formally assess the digital wellness of their patients and participants prior to involving them in e-health processes.

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