

The Ethics of Digital Well-Being: A Thematic Review

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Abstract

This article presents the first thematic review of the literature on the ethical issues concerning digital well-being. The term ‘digital well-being’ is used to refer to the impact of digital technologies on what it means to live a life that is *good for* a human being, and review the existing literature on the ethics of digital well-being, with the goal of mapping the current debate and identifying open questions for future research. The review identifies key issues related to four key social domains: healthcare, education, governance and social development, and media and entertainment. It also highlights three broader themes: positive computing, personalised human-computer interaction, and autonomy and self-determination. The review argues that three themes will be central to ongoing discussions and research by showing how they can be used to identify open questions related to the ethics of digital well-being.

Keywords: artificial intelligence; digital well-being; ethics of technology; positive computing; self-determination

1. Introduction

When the British Academy and Royal Society (2017) placed the *promotion of human flourishing* as the overarching principle for the development of systems of data governance they were

acknowledging a growing interest in digital well-being—an interest that is also noted in many additional reports and articles (e.g. IEEE 2017; Floridi et al. 2018). The expression ‘digital well-being’ refers in this article to the impact of digital technologies on what it means to live a life, that is *good for* a human being in an information society (Floridi 2014a; 2014b).

Some have argued that digital technologies will usher in a new era of increased productivity and help reduce social inequality by enabling better access to currently strained services, such as healthcare (Schwab 2017).¹ Others have focused on how digital technologies can be used to promote well-being and further human potential, by leveraging insights from the behavioural and cognitive sciences regarding human motivation and engagement (Peters et al. 2018). However, positive opportunities are counterbalanced by concerns, ranging from whether the growing rise of mental health issues in adolescents (e.g. depression, anxiety) can be attributed to technologies such as social media (Twenge et al. 2018; Orben & Przybylski 2019), to understanding the extent of disruption to labour markets and related well-being issues, which will be caused by increased automation (Frey & Osborne 2017). As a result, the ethical debate on so-called ‘digital well-being’ is now significant.

The goals of this article are to provide the first, critical review of the existing literature on the ethics of digital well-being, map the key issues in the current debate, and identify open questions for future research on digital well-being. Section 2 provides a thematic review of the literature, organised according to the key social domains represented in the records. Section 3 offers a critical perspective on the reviewed literature, drawing out broader themes that help us identify open questions and ethical challenges that require further research and discussion. Section 4 concludes the article by summarising its key findings. The Appendix contains the methodology used for the literature review.

2. Four Social Domains: A Review of Key Issues

The review identified four main social domains: healthcare, education and employment, governance and social development, and media and entertainment.

¹ Inequalities in access to and use of ICT services remain one of the biggest hurdles to maximising many of the opportunities discussed in this review, and is a key target for meeting the UN’s Sustainable Development Goals.

2.1. Healthcare

The domain of healthcare represents a significant portion of the review, with 44 of the 132 records directly concerned with health or healthcare in some form. In healthcare, well-being is typically conceived as an individual's quality of life (QoL), and many studies explore how digital technologies could potentially improve QoL (Feng et al. 2018; Khayal & Farid 2017; Kibel & Vanstone 2017)². In some cases, the concept itself is expanded to accommodate more than just the physical or mental health of the individual. For example, in discussing their smart living concept, Keijzer-Broers and colleagues (2016, p. 3462) note that QoL “emphasizes a safe home environment, good health conditions and social cohesion of the individual”. The expansion of the concept of health (and related variants), as a result of technological innovations (e.g. smart tracking), has been noted by a number of sociologists and political scientists (Kickbusch 2006), including defenders of the ‘biopsychosocial model’ of health (Engel 1977). However, the emphasis on how digital technologies *empower* individuals to look after their own health is more notable than the expanded understanding of what constitutes ‘health’ and ‘QoL’ (Chen 2011; Khudair & Alosan 2015; Leroy et al. 2014). In some cases, this empowerment has been highlighted in connection with the *enhancement of human capabilities* (Earp et al. 2014; Klein et al. 2015), and in relation to the promotion of an individual's *self-determination* (Bennett et al., 2017; Thieme et al. 2015; Taddeo & Floridi 2018). This approach suggests a shift to a more patient-centric understanding of healthcare, influenced by the empowering effects of digital technologies that help users monitor and track their physical and mental health (Amor & James 2015). Such a shift may help address some of the challenges facing national healthcare systems (e.g. ageing population), it also brings a new range of ethical risks. Two of these issues are well-known: *privacy* and *autonomy*.

In the case of privacy, the ethical risks surrounding use of personal and sensitive data are widely addressed (Ahn 2011; Freitas et al. 2017; Lehavot et al. 2012; Sinche et al. 2017; Soraghan et al. 2015). They range from the risks that the exposure of health-related information may pose for an individual's well-being due to real and perceived stigmatization (PETRAS Hub Forthcoming), to concerns about the inference of sensitive information from seemingly benign

² More specific variants also exist, such as ‘quality-adjusted life years’ or ‘disability-adjusted life years’. See Hausman 2015) for a discussion.

(and in some cases public) datasets (Horvitz & Mulligan 2015). The risks are most prominent in relation to smart home technologies, either in a patient's own home or in a care home setting, where expectations of privacy are often highest (Feng et al. 2018; Margot-Cattin & Nygård 2009; Mulvenna et al. 2017; Palm 2013; Tyrväinen et al. 2018).

In the case of autonomy, a common theme is the tension between ensuring the safety of patients, possibly through interventions, and respecting their right to autonomy (Bennett et al. 2017; Mahoney et al. 2007; Margot-Cattin & Nygård 2009; Sharkey & Sharkey 2012; Van Hooren et al. 2007). However, several articles also warn against the blanket prescription of decontextualized ethical concepts or principles in lieu of a careful examination of how the nature of certain illnesses alter their application. A noteworthy case is the challenge of using assistive technologies for patients suffering with some form of dementia. When it comes to implementing assistive technologies (e.g. monitoring systems), as Margot-Cattin and Nygård (2009) note, people affected by dementia may not always express valid informed consent. Therefore, ensuring the safety of patients, while also respecting their autonomy, is beset with ethical issues. The simple technology system they suggest—a room access control system for patients and caregivers that could be updated with modern IoT-enabled devices—was designed to balance considerations of safety and autonomy, and provides a good example of how digital technologies alter the way one may approach value-laden concepts such as 'autonomy' when contextualised to a specific setting (see Margot-Cattin & Nygård 2009 for details).

Going beyond the concepts of privacy and autonomy, Palm (2013) notes that, although assistive technology is often marketed as a form of care that promotes an individual's independence or empowerment, the deployment of assistive technologies can often lead to a *transfer of care* from specialized institutions into care recipients' homes, which in turn raises distinct legal, social, and ethical issues that are most prominent in the domain of healthcare. Within this broader issue of *transfer of care*, three additional issues emerge: *accountability*, *intelligibility*, and *accessibility*³.

In terms of *accountability*, several articles argue that the growing development of assistive technologies for domestic use are placing excessive burdens on informal caregivers (e.g. parents

³ These issues are merely representative and not intended to be exhaustive. For example, reliability or trustworthiness of information are also noteworthy problems that raise distinct ethical concerns.

or family members) by distancing patients from professional healthcare providers and possibly decreasing the accountability of national health services (Hampshire et al. 2016; Palm 2013). This concern is closely intertwined with the second issue of *intelligibility*.

Consider how providing users with information pertaining to their health and well-being may raise anxiety originating from a misunderstanding of the information. This concern is raised particularly clearly in (Hall et al. 2017), with a review of the intelligibility (and transparency) of online direct-to-consumer genetic testing services offered in the UK. As the authors note, many of these online services are marketed as online tools for enabling individuals to “make more informed decisions about their health, wellness and lifestyle” (Hall et al. 2017, p. 908). Using the good practice principles developed by the UK Human Genetics Commission, they found that most of the services reviewed failed to offer some form of supplementary support services to help users “better understand or cope with the implications of test results” (Ibid.). In a traditional patient-doctor relationship, this supplementary support is a core duty of the primary caregiver (e.g. alleviating anxiety by reporting information pertaining to an uncertain diagnosis in an appropriate manner). The primary caregiver has some degree of accountability not only for the treatment of the patient, but also their understanding. However, this same relationship is not easily reproduced or maintained in the case of eHealth technology.

Finally, a number of articles raise the issue of whether eHealth technologies will be *accessible* to those who need them most. A variety of barriers to accessibility are discussed, and include poor interface design that impedes segments of the population (e.g. elderly patients) from accessing a particular service (Sánchez et al. 2015); overly complex presentation of information that prevents users from making sense or practical use of the recommendations (Rughiniş et al. 2015); and prohibitive costs associated with the development of the relevant technology (Sharkey & Sharkey 2012). In this regards, it is promising to see advanced technologies, such as assistive robotics or medical-grade monitoring devices, being targeted towards consumers, hopefully with the intention of improving accessibility.⁴ Although this will in time help to remove barriers to accessibility that are caused by prohibitive economic costs,

⁴ Key examples here are the inclusion of an EKG sensor on the most recent iteration of the Apple Watch in the US (<https://www.wired.com/story/apple-watch-series-4/>), and Samsung’s announcement of a new range of robotics for assisted living (<https://www.cnet.com/news/bot-care-leads-a-legion-of-new-samsung-robots-at-cs-2019/>).

maximising the opportunities of digital technologies requires designers and regulators to address also the issues of accountability, intelligibility, privacy, and autonomy.

In 2005, the WHO proposed a resolution for member states to establish national strategies for implementing eHealth solutions (i.e. the cost-effective and secure use of information and communication technologies in support of health and health-related fields) (World Health Organisation 2005). Over a decade later, eHealth remains a key focus for policy makers. For example, the European Commission (2018) recently stated that digital technologies are a necessity for dealing with challenges such as a growing and ageing population, health workforce shortages, and the rising burden of preventable non-communicable diseases. Many of the echo similar points, with a significant number of contributions focusing on how assistive technologies could support the independence of elderly individuals in their own home and support the challenges of residents in care homes (Asghar et al. 2015; Bennett et al. 2017; Bryant et al. 2017; Dasgupta et al. 2016; Devillier 2017; Mahoney et al. 2007; Margot-Cattin & Nygård 2009; Misselhorn et al. 2013; Mulvenna et al. 2013; Palm 2013; Reis et al. 2016; Sharkey & Sharkey 2012; Silva et al. 2015).

Digital technologies will continue to shape how medical research and practice will develop in the near future. For instance, innovations in mHealth technologies enable new streams of data that can enhance a patient's capabilities or help mitigate problems such as medication non-adherence (Toboso 2011; Dasgupta et al. 2016). In addition, machine learning (ML) technologies are offering more reliable and efficient ways to diagnose illnesses such as Alzheimer's (Ding et al. 2018), and developments in virtual reality/augmented reality (VR/AR) technology and brain-computer interfaces are providing new research avenues for physical rehabilitation (Folgeri & Lucchiari 2017), while also offering novel treatment methods in cognitive behavioural therapy (Pot-Kolder et al. 2018). At the same time, some articles argue that digital technologies may also cause harm to user's mental health or, possibly, contribute to behavioural addiction (Grubbs et al. 2018; Szablewicz 2010).

The use of digital technologies in healthcare does not stop with artificial intelligence (AI) and robotics, it also includes social media in a clinical setting. (Lehavot et al. 2012) presents a thorough discussion of the ethical considerations that clinicians face, using a case study of

whether to intervene following detection of suicidal posts by patients on social media.⁵ Employing well-known principles from bioethics (Beauchamp & Childress 2013), Lehavot and colleagues (2012) expose the underlying tension that can emerge between the imperatives of ‘do good’ (beneficence) and ‘do no harm’ (non maleficence). For example, they note that self-disclosure of suicidal thoughts can be therapeutic for patients, and, therefore, the automated detection of ‘at risk patients’ by machine learning (ML) algorithms may be subject to a high-rate of false positives due to insufficient contextual information and understanding. Inappropriate clinical intervention, stemming from beneficent intentions but on the basis of inaccurate information, could cause unintended harm by failing to respect a patient’s perceived boundaries of privacy and autonomy.

Nevertheless, the opportunities for using social media in healthcare are numerous. They range from enhanced capabilities for self-care, thanks to increased personalisation of information in online settings such as social media (Hamm et al. 2013), to population-scale insights about healthcare that can inform resource allocation at the policy level (Althoff 2017; Eichstaedt et al. 2015; Khoury & Ioannidis 2014). It is worth stressing that in the medium and long term, this approach may lead to favour an over-reliance on datasets derived from social media and, therefore, create too wide a distance between researchers and the population under study (Althoff 2017)—another form of the transfer of care (i.e. accountability for the well-being of research participants).

2.2. Education and Employment

The Future of Jobs report by the World Economic Forum addresses how technological drivers such as high-speed mobile internet, AI, big data analytics, and cloud computing, are transforming global labour markets (World Economic Forum 2018). Introducing the report, Klaus Schwab notes that “[t]he inherent opportunities for economic prosperity, societal progress and individual flourishing [...] depend crucially on the ability of all concerned stakeholders to instigate reform in education and training systems, labour market policies, business approaches to developing skills, employment arrangements and existing social contracts” (World Economic Forum 2018,

⁵ See (Burr & Cristianini Draft) for an overview and discussion of automated detection of psychological traits or mental states from digital footprints (including social media).

p. v). A number of articles address issues related to these points. For example, (Pedaste & Leijen 2018) provides a brief discussion of how a variety of digital technologies, including VR/AR, could support lifelong learning, self-fulfilment and openness to new opportunities. (Karime et al. 2012) offers tentative evidence pertaining to whether interactive video game-based learning could improve certain cognitive skills (e.g. memory) in students. And (Baras et al. 2016) describes how smartphones could automatically detect a student's mood and help with the management of workload through increased awareness of stress and emotional understanding. However, in each of these cases, the primary focus is on the measurable impact that a digital technology has on a behavioural or psychological attribute that may only be indirectly linked to well-being (e.g. ability to pay attention). The broader ethical impact of the technology in question, or the risk of unintended consequences, is often overlooked.⁶ This can be best illustrated through a critique of some of the reviewed publications that discuss stress management in employment and education.

Several articles focus on the link between stress and individual or corporate well-being (Andrushevich et al. 2017; Baras et al. 2016; Freitas et al. 2017; Garcia-Ceja et al. 2016) and propose some form of automated measurement to infer an individual's psychological state (e.g. detecting levels of occupational stress from a smartphone's accelerometer). Although some contributions highlight ethical issues such as privacy (Garcia-Ceja et al. 2016), there is a notable gap concerning how the process of automated measurement could itself lead to lower levels of well-being. For example, a recent study explores how the increased use of digital technologies in schools, sometimes for the purpose of employee measurement or the management of performance targets, is related to a negative impact on well-being (i.e. increased anxiety, stress, and depression) (Skinner et al. 2018). The authors of the study also note that the way digital technologies can be "implemented through managerialism in schools can have a negative impact on teachers' morale and sense of professional identity" (Skinner et al. 2018, p. 3). This suggests that, in addition to negating any of the intended benefits of the respective technology, there could also be wider unintended consequences from implementing digital technologies in some employment settings, such as interfering with a teacher's self-determination and ability to

⁶ One exception is O'Donnell (2015), who argues that by co-opting the practice of mindfulness, in order to help students improve their ability to pay attention or better cope with information overload, the ethical orientation of the practice itself becomes programmatic rather than pedagogical.

internalise important values related to their self-identity as an educator. Although some studies explore how techniques, like gamification, could be used to promote employees engagement and self-determination (Barna & Fodor 2018; Shahrestani et al. 2017), they address only partially the problems posed by attempts to quantify the well-being of teachers and students.

Caicedo and colleagues (2010) raise a related concern in relation to the technical need for representing or recording the measurement outcome of a well-being assessment within the system being used (e.g. level of positive emotion). The point is succinctly expressed by their reference to the phrase “what gets measured gets managed” (Caicedo et al. 2010, p. 445). It emphasises the fact that non-quantifiable features, such as individual values or professional and personal identity, can often be overlooked, simply because the technical systems used for managerial control are unable to represent them in an appropriate format (e.g. quantitatively). These concerns raise the question as to whether the deployment of some digital technology (e.g. automated monitoring), over the employment of a human, is always the best choice.

2.3. Governance and Social Development

Many national governments have become increasingly interested in the sciences of well-being and their impact on policy (Huppert et al 2013; Stiglitz et al. 2008), and hence in the use of digital technologies, such as big data and ML, to help monitor national indicators of well-being. All this raises new ethical issues. Horvitz and Mulligan (2015) note the need for a balance, when pursuing socioeconomic insights, between their value for policy-making and the cost in terms of increased privacy risks (e.g. exposing sensitive information). They argue that privacy regulations and laws, in the United States specifically, are based on the assumption that “the semantics of data are [sic] relatively fixed and knowable and reside [sic] in isolated context” (Horvitz & Mulligan 2015, p. 253). However, developments in ML and data analytics are challenging this conception, as new insights and inferences can be derived from existing datasets. Horvitz and Mulligan (2015) suggest that governance should be based on what they call ‘use-based’ approaches (i.e. what the data is used for), in order to mitigate the privacy risks of so-called ‘category-jumping’ inferences, which reveal attributes or conditions that an individual may have otherwise wished to withhold.

Ethical issues connected to governance and social development also arise in relation to digital technologies used for *smart cities* (Khayal & Farid 2017; Oliveira et al. 2014). A study performed by IPSOS and Vodafone found that, among sampled respondents, “[f]uture smart

city technologies have a higher acceptance and are perceived as greater digitisation benefits than health innovation” (Vodafone Institute for Society and Communications 2018, p. 41)⁷. The authors of the study claim that this is because the data necessary for smart city scenarios are less sensitive than in other domains, such as healthcare, and the scenarios themselves more tangible.

In spite of the differing attitudes towards digitisation of smart cities and digitisation in healthcare, however, many articles connect the two themes (see section 2.1), suggesting a need for further conceptual research into *societal attitudes* towards digital well-being. For example, Khayal and Farid (2017) see the development of smart cities as an important factor in improving the non-biological, socioenvironmental determinants that underlie citizen well-being, and which could extend healthcare by offering an additional data stream that would reflect more accurately the multidimensional nature of health *and* wellbeing. This is an interesting proposal. Addressing the differing societal attitudes towards healthcare and social development, also highlighted in the IPSOS and Vodafone, is a necessary preliminary step to its successful realization.

2.4. Media and Entertainment

Digital technologies associated with media and entertainment offer new opportunities for promoting well-being. For example, VR/AR could help widen access to public resources such as art galleries and museums, which are often viewed as intrinsic public goods (Fassbender et al. 2010). In addition, online gaming could help improve self-understanding and emotional well-being, by providing an opportunity for players to engage with different narrative forms of self-expression through their in-game avatar (Fröding & Peterson 2013; Johnson et al. 2013; Kartsanis & Murzyn 2016). Developing on the latter topic, Kartsanis and Murzyn (2016) argue that gaming offers distinct opportunities for self-exploration that are not found within more passive forms of media. They state, “[a]ssuming and exploring different perspectives in order to empathise and understand others may indicate a eudaimonic motivation for appreciation and meaning” (Kartsanis & Murzyn 2016, p. 33). This process can be empowering and possibly lead to greater self-understanding, because a game’s character can serve as a dynamic representation of the player’s ideal-self that they have some control over, but can also help signify possible moral shortcomings or character deficiencies in the individual’s real-world self-identity, through

⁷ The quantitative research sampled 9,005 adults aged 18-65 across 9 countries.

the cultivation of in-game moral decision-making (Fröding & Peterson 2013). Johnson and colleagues (2013) focus on the theme of empowerment, using the framework of self-determination theory (Ryan & Deci 2017), to argue that online gaming can also satisfy the need for social relatedness through processes such as helping and chatting with others in order to pursue shared goals (e.g., task planning in massive multiplayer online games).

The literature also highlights important ethical risks linked to these uses of digital technologies. For example, in the case of VR/AR technologies, Madary and Metzinger (2016) discuss the risks associated with long-term immersion in virtual environments. They explore how altering the typical structure of our environment through VR/AR technology can lead to psychological and neurophysiological changes as a result of neuroplasticity. These risks are especially troubling in the neural and behavioural development of children and adolescents, as it is not yet fully understood how long-term immersion in VR could impact the development of their perceptual or motor systems.

Some contributions focus on the impact on psychological and behavioural developmental. For example, Kahn and colleagues (2013) argue that social robotics could impede development of communicative virtues and moral reasoning.⁸ In addition, Grubbs and colleagues (2018) suggest that perceived addiction to online pornography can have a negative impact on the development of one's religious and spiritual identity. Although Madary and Metzinger (2016) offer a detailed set of ethical guidelines intended both for researchers and the public, their guidelines are tailored to the governance of VR specifically. Their utilisation of well-known principles from biomedical ethics (Beauchamp & Childress 2013) suggests that their guidelines could be adapted to more general concerns about how digital technologies may impact behavioural and psychological development. However, due to the wide-ranging nature of these concerns, the four principles of bioethics offers a good starting point, but are insufficient to address the plethora of issues related to the impact of digital technologies on behavioural and psychological development.

⁸ Similar concerns have emerged in the popular media surrounding the growing use of voice-activated smart assistants and the impact that their use has on the development of conversational norms in children (Gonzalez 2018). These concerns have led technology manufacturers to respond by incorporating new features into their devices that can reward politeness in children, though the wider psychological impact is still poorly understood.

Social media are also a notable discussion point in the literature. For example, Hart (2016) notes the positive role of social media on well-being, as he argues that social media provide an opportunity for individuals to engage in ‘edgework’ (i.e. the purposeful engagement of risky behaviour as a result of its seductive character and the rewards it brings) (Lyng 2005). This enables individuals to understand better the limits of their emotional well-being and cultivate skills of self-determination in an online setting, in a way similar to what may happen sometimes in online gaming. In addition, Khudair and Alosan (2015) stress that social media can empower informal caregivers (e.g. parents of autistic children) by improving their feeling of social relatedness, while at the same time offering community-driven information pertinent to their situation. Toma and Hancock (2013) suggest that social media sites can be used by individuals for the purpose of self-affirmation (i.e. validating social feedback), following a negative encounter in an offline setting (e.g. cyberbullying).

Further ethical concerns about the impact that social media may have on individual and social well-being are raised in the literature. Chen and colleagues (2017), for example, show how information shared by users (e.g. photography) can be used to infer information about a user’s mental state (e.g. happiness), which in turn could be misused by social media companies experimenting with the manipulation of user’s emotional states (Kramer et al. 2014), or advertisers looking to target very specific audiences (Matz et al. 2017). In addition, (Valkenburg et al. 2006) discusses how social feedback could impact the development a user’s self-esteem; (Verduyn et al. 2015) explores how passive versus active use of social media impact user’s emotional development of affective well-being; and (Ahn 2011) demonstrates how a student’s sense of safety and security is affected by privacy settings on social media sites.

Vallor (2010, p. 158, emphasis added), however, takes a slightly different approach, and focuses on the “technology-driven changes in the *moral character* of IT users, rather than measuring only the *psychological and social benefits* accrued or lost through such use”. In (Vallor, 2010; 2016), she develops a virtue-theoretic or eudaimonic account of well-being, in order to focus on ‘communicative virtues’ (i.e. patience, honesty, empathy, fidelity, reciprocity, and tolerance), which are implicated in social media. Her main concern is that psychological studies of subjective well-being often ignore this moral dimension, and yet social media seems to represent a key challenge to the development of these moral virtues. The exact nature of this challenge is hard to substantiate at present, as the existing empirical literature on social media’s

impact on well-being is rather fragmented and much disagreement remains (e.g. Orben & Przybylski 2019; Twenge et al. 2018). This is both a consequence of the methodology of the studies (i.e. differing assumptions regarding the choice of construct to measure) and of the nature of social media (i.e. diversity in scope, purpose and demographics of a particular site) (Best et al. 2014).

3. Three Broader Themes: Identifying Opportunities and Risks

In addition to the key issues found within each of the above social domains, three broader themes were identified by the review: ‘positive computing’, ‘personalised human-computer interaction’, and ‘autonomy and self-determination’. Critical analyses of these themes shed light on the opportunities and risks related to digital well-being and on the open questions that require further research and discussion.

3.1. Positive Computing

Positive computing builds on research in *positive psychology*, which studies the individual and social factors that foster human flourishing (Seligman & Csikszentmihalyi 2000), in order to understand how to design digital interfaces that promote users’ well-being (Calvo & Peters 2013; Desmet & Pohlmeier 2013). Like positive psychology, positive computing acknowledges the difference between design that focuses on creating new opportunities or capabilities for promoting well-being, versus design that focuses simply on identifying and removing problems. In this sense, positive computing addresses “the *optimal* (rather than just average) end of possible human psychological functioning” (Calvo and Peters 2014, p. 14, emphasis added). But optimisation requires some form of measurement, and it is here that a number of pressing ethical issues arise.

The measurement of well-being presupposes a theoretical framework within which to enumerate its constituents and, in turn, to explain why some aspect of well-being is prudentially valuable. This raises an important challenge for positive design, as it is unclear whether the kind of well-being that a technology targets is *universally accepted* as bearing prudential value, or it applies more locally to a subset of users. For example, the well-being of individuals suffering from dementia (Margot-Cattin & Nygård 2009) is likely to be very different from the one of healthy

and developing child (Alexandrova 2017). Desmet and Pohlmeier (2013, p. 6) acknowledge a version of this concern, and note that the wide-ranging initiatives of positive computing makes these comparisons challenging. In response, they break design goals into *design for pleasure* (i.e. experiencing positive affect), *design for virtue* (i.e. being a morally good person), and *design for personal significance* (i.e. pursuing personal goals), suggesting that clearer goals for promoting well-being are considered. This distinction is a helpful heuristic, and it can also be useful when one considers how to embed ethical reflection into the design process, but it is also limited in important respects. Firstly, although they note that a multitude of life domains, including social relationships, can be accommodated within their three categories, some may object that the prudential value of social relationships (or social well-being) should not be subservient to the prudential value of *pleasure*, *virtue*, or *personal significance*. This concern is philosophical in nature, but it is suggestive of a gap that could be addressed through a greater appreciation of how ethics is necessary for the successful governance of digital technologies (Floridi 2018).

Embedding ethics more closely into the design process of digital technologies is becoming more common (Brey 2015; Calvo & Peters 2013; Ijsselsteijn et al. 2006; Roeser 2012; Shahriari & Shahriari 2017; Vallor 2016). For example, privacy concerns are often highlighted in terms of whether to process data client-side or server-side (Sinche et al. 2017; Weiss et al. 2016), how to meet the technical demand of data minimisation (Tollmar et al. 2012), and whether to avoid using more privacy-invasive monitoring (e.g. video recording technology) when alternatives are feasible and elicit greater trust in users (Feng et al. 2018; Garcia-Ceja et al. 2016; Kocielnik et al., 2013). These developments are promising, because, as Roeser (2012) notes, when designers evaluate the possible opportunities and risk associated with their technology, they make a value-laden choice about which consequences are beneficial, and thus should be promoted, and which are harmful, and thus should be avoided. She argues, that it is vital that the research and design process for well-being (and health) technologies is sensitive to the ethical assumptions and implications latent in such consequential decision choices.

In connection with this, Peters and colleagues (2018) show how the impact of design should be considered across multiple spheres of experience, ranging from the experience of an individual user at adoption of the technology to the wider experience of all members of society. Each sphere of experience raises important normative questions that target a different aspect of well-being, and are measurable using different scales (e.g. 'life experience', raises the question

“To what extent does the technology influence the user’s experience of psychological need satisfaction in their life overall?”) (Peters et al. 2018, p. 8). The model they present is the most comprehensive framework for evaluating digital well-being to date, and makes specific use of self-determination theory to understand the impact of digital technology on motivation, engagement, and well-being.

At the same time, some articles stress the need to consider the differing ethical demands of various industries (e.g. industrial IoT, smart homes, smart cities, health care) (Markendahl et al. 2017), and propose a kind of *reflective equilibrium* between the ethical principles or guidelines and the target technology that was proposed (Mittelstadt 2017b; Vallor 2016). The motivating idea behind these suggestions is that, because technological innovation is rapid and incessant, a rigid and fixed ethical framework will be ill-equipped to deal with novel demands and quickly become unfit-for-purpose. Designers and engineers may view this iterative process as a burden and as a possible impediment to innovation. However, it is becoming increasingly clearer that “companies which fail to innovate ethically and responsibly not only damage public trust but are also at greater commercial risk” (Hall et al. 2017, p. 916).

Positive computing is about enhancing our capabilities. In line with this goal, some have proposed using digital technologies as a form of *moral enhancement*, understood as a more literal way of embedding ethics into technology by offloading decision-making to an artificial moral agent (Giubilini & Savulescu 2018). The motivation behind this suggestion is that humans are “suboptimal information processors, moral judges, and moral agents” and, therefore, an artificial moral advisor could promote another form of personal *reflective equilibrium*, by enabling an individual to consider aspects of their moral character which need improvement or refinement (Giubilini & Savulescu 2018, p. 170). For the time being, this kind of *technologically-mediated moral enhancement* remains a somewhat futuristic proposal. Nonetheless, moral and cognitive enhancement is an important goal of positive computing (Earp et al. 2014; Klein et al. 2015; Krutzinna 2016), and explores how emerging technologies, such as brain-computer interfaces, could potentially enhance our cognitive abilities and lead to greater levels of well-being. These suggestions raise more immediate concerns about digital well-being. For example, Krutzinna (2016) argues that well-being is often deployed as a somewhat vague concept and thus imposes too few practical constraints on an individual’s decision-making. To illustrate her point, consider a parent who is trying to determine whether to impose constraints on his/her child’s social media

usage, on the basis that it diminishes their attentional capacities and thus leads to lower levels of well-being. Here, because ‘well-being’ is inadequately specified, it can play no instrumental role over and above the considerations pertaining to the potential diminishment of the attentional capacities of a child. While this is not an argument for ignoring well-being, it stresses the need for greater attention to its theoretical specificity (i.e. making explicit the constituents or determinants of well-being that are being assumed).⁹ Here, one sees a larger gap, which requires further discussion: how should one design and implement technology when faced with uncertainty about the consequences of specific choices?

Floridi and colleagues (2018) summarise the key issue here, when presenting an ethical framework that is designed to evaluate the opportunities and risks for society that are associated with technologies such as AI. As they note, “[c]ompliance with the law is merely necessary (it is the least that is required), but significantly insufficient (it is not the most than can and should be done)” (Floridi et al. 2018, p. 694). To this, one may also add that *functional* (or, merely technical) considerations during the design process of some technology are also necessary but insufficient for promoting well-being, and that ethical design is required to leverage fully new opportunities for promoting well-being. Ethics often demands that an agent goes over and above what is legally permissible, but this does not mean that it should be viewed as a barrier to innovation. Rather, ethics has the *dual-advantage* of enabling “organisations to take advantage of the social value that AI enables” as well as anticipating and avoiding costly mistakes that “turn out to be socially unacceptable and hence rejected, even when legally unquestionable” (Floridi et al. 2018, p. 694). As such, it is crucial to continue to develop ethical guidelines that engage multi-stakeholder groups, to ensure that the full potential of positive computing is harnessed.

⁹ The lack of both theoretical and empirical understanding of the goals of well-being is one of the most important gaps identified in the literature, as discussed in (Krutzinna 2016). This gap could result from, among other things, disagreement regarding the best way to measure a particular well-being construct, or from uncertainty about the causal relationship between the use of a digital technology (e.g. a smartphone) and a psychological effect (e.g., increased anxiety or depression). For example, there has been a wide, and yet unsettled, discussion about the impact that screen time has on subjective well-being (Gonzalez 2019; Orben & Przybylski 2019; Twenge et al. 2018;). As of writing, there still appears to be much uncertainty in the scientific community regarding the scope and validity of empirical claims that underlie these discussions.

3.2. Personalised Human-Computer Interaction

The ubiquity of digital technologies that are equipped with sensors for monitoring user's behaviour and environmental conditions, combined with advances in data management and analytics, has resulted in the increased viability of personalised human-computer interaction (e.g. personalised recommendations). What are the opportunities and risks associated with personalisation as a design strategy for digital well-being?

Valleé and colleagues (2016, p. 186) define personalisation as “the ability to provide contents and services tailored to individuals based on knowledge about their needs, expectations, preferences, constraints, and behaviours.” In line with this, Spanakis and colleagues (2014, p.23) claim that “personalised mobile technologies based on behavioural and motivational models may prove to be valuable persuasive tools and means to foster healthier life styles and sense of wellbeing throughout an individual's life span.” For example, personalisation may allow for more focused consideration of fine-grained notions of well-being, such as ‘maternal well-being’ (see McDaniel et al. 2012). However, many forms of personalised technology, especially those that learn about user's preferences, require the monitoring of relevant behavioural signals, in order to measure improvement and track goal progress. Public attitude towards these techniques has been impacted negatively by recent data abuses stemming from micro targeting of advertisements on the basis of such data (PEW Research Center 2018). Aside from the misuse of profiling and personalisation techniques, the review identified two more issues related to personalised human-computer interactions: *usability* and *accessibility*.

Positive design considerations include whether some technology is *usable* in an ergonomic sense, e.g., whether it is cumbersome to use or requires an excessive level of information input that burdens the user. However, as Meyer and Boll (2014) note, focusing too much on one usability requirement, such as *unobtrusiveness* (e.g., designing small sensors that can be embedded into smart textiles, or designing systems that attempt to automate and outsource some part of the decision-making process), can have a negative impact on a user's well-being if the resulting measurement outcome is less accurate than a more obtrusive alternative. At the same time, design considerations need to include considerations about *accessibility* and *usability* for all segments of a population (see section 2.1). In this vein, Toboso (2011) highlights the challenge that people with disabilities face when using certain technologies. He refers to the United Nations Convention on the Rights of Persons with Disabilities, and its definition of ‘universal

design' as "the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." The goal of universal design is laudable, but is poorly represented in the literature at present.

Going beyond considerations of disability, a number of articles discuss how, for example, interface design often fails to consider the accessibility requirements of certain groups of individuals (e.g. elderly users), thus restricting their access to technologies that could promote their well-being (Sánchez et al. 2015; Silva et al. 2015). Such restrictions are not simply physical in nature; they may also depend on the levels of media literacy of users. Here, the notion of accessibility to information must not be construed simply as the removal of barriers, but also as the curation of information in ways that respect an individual's abilities. As Bryant and colleagues (2017, p. 5) note, "[i]t is estimated that 12.6 million adults (23%) in the UK do not have the required level of aptitude in managing information, communicating, transacting, problem solving and creating. Among people aged 65+ this rises to 43% and is the group that has the lowest digital device ownership and are often retired so could lack access to technology that working people often have."

Consideration of media literacy helps bring into focus important aspects of what one may term *epistemic accessibility*, such as the need for presenting information in ways that afford the user actionable and perhaps personalised insights, rather than simply burdening them with information, or raising anxiety through inappropriate delivery of sensitive information (e.g., healthcare). As one possible solution worth developing, Mitrpanont and colleagues (2018) explore how a chatbot could be incorporated into a monitoring system that is designed to notify an individual about environmental information relevant to their health (e.g. levels of pollution), potentially guaranteeing the individual has a way to ensure they understand the information being presented to them.

It is understandable that designers may feel uncomfortable with some of the suggestions explored in this section, especially in light of the growing debates around paternalistic uses of technology (Floridi 2016), or the possible risks of polarisation stemming from increasingly personalised data streams. However, to unlock the value of personalised technology it is important to tackle these concerns head-on. As discussed in the next section, a shift in how one understands related concepts such as autonomy, capabilities, and self-determination, may help alleviate some of these issues.

3.3. *Autonomy and Self-Determination*

Autonomy has become an important topic in relation to the interactions between human users and digital technologies, especially persuasive technologies that seek to learn about a user's preferences and steer their behaviour towards pre-determined goals (e.g. maximising engagement) (see Burr et al. 2018 for a discussion). Unsurprisingly, therefore, the ethical issues related to autonomy are discussed across a wide-range of records (Calvo & Peters 2013; Desmet & Pohlmeier 2013; Hart 2016; Lehavot et al. 2012; Rughiniş et al. 2015; Taddeo 2014; Vallor 2010; Van Hooren et al. 2007). However, the approaches taken to autonomy differ widely, suggesting that particular aspects of the concept are only perspicuous when applied within a target social domain (e.g. employment versus education), or when considering specific implementations of digital technology (e.g. an assistive technology for home care).

Rughiniş and colleagues (2015), for example, extract five dimensions of autonomy that are useful for understanding the mediating role that health and well-being apps have on the communication of information. The dimensions are (a) degree of control and involvement that the user has within the app; (b) degree of personalisation over the apps functionality; (c) degree of truthfulness and reliability related to the information presented to the user, and how this affects their decisions; (d) user's own self-understanding regarding the goal-pursuit, and whether the app promotes or hinders a user's awareness of their own agency; and (e) whether the app promotes some form of moral deliberation or moral values in the actions it recommends. These five dimensions help to bring some aspects of autonomy into greater focus, but may also obscure others. For example, although and colleagues (2015) make room for *social relatedness* within their five dimensions, defenders of substantive-relational accounts of autonomy may argue that it requires greater emphasis as a dimension in its own right (MacKenzie 2008).

With regards to well-being, what is most important about the autonomy debate is that one keeps in mind how a *freedom to choose and to self-determine* is often understood as an intrinsic good or right, rather than merely a means to secure well-being. As Sen (2010, p. 18) notes: "The freedom to choose our lives can make a significant contribution to our well-being, but going beyond the perspective of well-being, the freedom itself may be seen as important. Being able to reason and choose is a significant aspect of human life. In fact, we're under no obligation to seek only our own well-being, and it is for us to decide what we have good reason to pursue."

This is not to suggest that any technologically-mediated intervention should be avoided in case it restricts a user's freedom to choose. Indeed, several contributions refer to Sen's capability approach for the purpose of showing how some technologically-mediated intervention, which could initially be misconstrued as paternalistic, can in fact be treated as autonomy-enhancing, if one views autonomy as intimately connected to an individual's social relations and environmental affordances (Kibel & Vanstone 2017; Misselhorn et al. 2013; Taddeo 2014; Toboso 2011). Instead, what is needed is a greater representation of these more developed theoretical accounts of autonomy in the development of digital technologies and the political and ethical discussions that shape their design and regulation.

When one moves away from simplistic dichotomies and tensions between autonomy and automation, towards more developed accounts of autonomy, specific ethical issues become clearer. For example, technologically-mediated nudges, often viewed as archetypal forms of paternalistic interventions, can sometimes be used to promote deliberative capacities (Levy 2017). In turn, they can help us avoid the problem of outsourcing decision-making to autonomous systems, as highlighted in (Vallor 2016). This issue is typically framed from a virtue ethics perspective (Shahriari & Shahriari 2017; Vallor 2016), emphasising the importance of conscious contemplation for the cultivation of human excellence. However, even if one chooses not to adopt a virtue ethics perspective, one can still appreciate why digital technologies that seek to present the user with information designed to elicit greater deliberative (perhaps moral) faculties are worthwhile.

In connection with this aspect, Rughiniş and colleagues (2015) argue that the 'truthfulness' of communicative messages requires further study, as the manner in which motivational notifications and nudges are framed could have a negative impact on an individual's well-being. For example, the fast and frugal nature of app communication, influenced by design principles from persuasive technology that target an individual's cognitive biases, often favours interventions on an individual's *extrinsic motivation* (Desmet & Pohlmeier 2013). However, as is well-known, targeting extrinsic motivators is often a short-term solution to behaviour change that bypasses the development of intrinsic motivators, which are the ones promoting long-term and sustainable self-determination (Ryan & Deci 2017). The importance of intrinsic motivation for sustainable well-being has also been noted by advocates of positive computing (Peters et al. 2018), and is changing how features like gamification are being used to promote self-

determination and user engagement (da Silva et al. 2013; Hall et al. 2013; Shahrestani et al. 2017). There is a key opportunity here for reconceiving the debate over autonomy by situating it within a psychological framework, such as self-determination theory, which treats autonomy as one basic psychological need among others.¹⁰

3.4. Open Questions

The three themes identified during the review will play a key role in ongoing discussions related to the ethics of digital well-being. Connecting these themes to the key issues identified in section 2 allows us to identify some open questions related to the ethics of digital well-being. The examples provided in Table 1 are not intended to be an exhaustive list of open questions on ethics of digital well-being. Rather, the list provides the starting point for further research and discussion on this topic.

Table 1 key issues and open questions related to the ethics of digital well-being. The table is organised according to the four social domains identified in section 2, and the three broader themes outlined in section 3.

	Key Issues	Positive Computing	Personalised Human-Computer Interaction	Autonomy and Self-Determination
Healthcare	<ul style="list-style-type: none"> • Patient empowerment or enhancement of capabilities • Privacy risks (e.g. use of sensitive data) • Trade-off between safety and autonomy • Transfer of care: accountability, intelligibility, accessibility 	<p>Does the incorporation of positive computing techniques into the domain of healthcare risk expanding or trivialising the concept of 'health' (e.g. more health is always possible)?</p> <p>In healthcare, how should one weight design considerations such as pleasure, virtue and personal significance when seeking to promote QoL?</p>	<p>Can personalised treatment be achieved while minimising the collection of sensitive data? If not, do the benefits (e.g. increased usability or accessibility) outweigh the risks (e.g. increased anxiety)?</p> <p>Is technologically-mediated personalised treatment the best way to improve accessibility requirements and achieve the goal of universal design?</p>	<p>How can empowerment or enhancement of a patient's capabilities be achieved while ensuring that responsibility or accountability for adequate care is not transferred to informal caregivers?</p> <p>How should specific assistive technologies balance the often-contrasting considerations of patient safety and autonomy?</p>
Education & Employment	<ul style="list-style-type: none"> • Changing needs of labour markets and 	Should one use positive computing	Should personalised monitoring of	How do digital technologies alter an

¹⁰ SDT identifies *three* basic needs (competence, autonomy, and relatedness), which must be satisfied for an individual to "experience an ongoing sense of integrity and well-being or "eudaimonia"" (Ryan & Deci 2000, pp. 74–75).

	<p>importance of lifelong learning</p> <ul style="list-style-type: none"> Automated monitoring or measurement of subjective well-being Self-understanding or identity 	<p>methods to improve student or employee engagement?</p>	<p>employee well-being be used?</p>	<p>employee's self-understanding or identity?</p> <p>Should digital technologies be used to enhance our moral capacities, or does this impede on an important aspect of the virtue of moral deliberation?</p>
<p>Governance & Social Development</p>	<ul style="list-style-type: none"> Societal attitudes towards trade-offs between privacy risks and potential value from population-scale datasets Greater awareness of environmental impacts on health and well-being 	<p>Could positive computing methods help promote social well-being, or are they only applicable at the individual level?</p>	<p>How can one protect an individual's privacy (or feelings of privacy) while unlocking the social value of big datasets?</p>	<p>How can smart cities enhance the capabilities of citizens and empower communities?</p>
<p>Media & Entertainment</p>	<ul style="list-style-type: none"> Empowerment (e.g. promotion of self-understanding or emotional well-being through interactive media) Developmental concerns from new technologies (e.g. VR) Impact of social media on psychological well-being and moral character 	<p>What are the risks associated with using positive computing methods to improve engagement with media (e.g. games that are too engaging may lead to behavioural addiction)?</p> <p>In lieu of scientific consensus regarding the impact of social media on mental health, how should one evaluate the possible risks (as parents, as a society, or as individuals)?</p>	<p>Are ethical guidelines sufficient to ensure our digital footprints are not misused? Or, are stricter legal frameworks required?</p>	<p>How should social media platforms be designed in ways that promote feelings of social relatedness?</p>

4. Conclusion

One of the key findings of this review is that, although some issues emerged across multiple social domains (e.g. empowerment), one must exercise caution when employing generalised principles or guidelines. Instead, one should ensure that ethical considerations play a central role at each of the key stages of the development, deployment, and use of specific digital technologies. Further research related to positive computing, personalised human-computer interaction, and autonomy and self-determination will provide useful insights in this respect.

The analysis showed how positive computing seeks to establish an empirically rigorous framework for technology design, implementation, and use, which is receptive to advances in behavioural and cognitive sciences (e.g., understanding basic psychological needs that impact engagement or motivation) (Peters et al. 2018). For this to succeed, it requires the cooperation of a wide variety of stakeholders to help evaluate the consequences of using technology to promote subjective well-being (e.g. those with expertise in ethics, law, sociology, and governance).

This review argued that the continued development of personalised human-computer interaction must address the many concerns related to privacy and data use (e.g. greater *accountability*, *intelligibility*, and *accessibility*) (PEW Research Center 2018). This is a necessary step to enable designer, providers, and decision-makers to seize the opportunities that personalised human-computer interaction could bring for well-being.

The analysis also stressed that the apparent tension between autonomy and automation has resulted in conceptual confusion regarding a cluster of topics such as self-determination, self-understanding, and identity (both individual and social). It is not the case that all forms of artificial decision-making entail a constraint on human autonomy, but to appreciate this one first needs a clearer understanding of the varied nature of human-computer interaction (Burr et al. 2018). It is promising to see that these issues are being widely discussed, and that more nuanced theoretical accounts of autonomy are being defined (MacKenzie 2008). A greater awareness and conceptual understanding of these theoretical developments could lead to a better scrutiny of digital technologies (and related social policies) that impact human well-being.

It is likely that different communities will concentrate on one or more of these areas to differing degrees. For example, psychologists will find that their expertise enables them to engage closely with positive computing, perhaps utilising advances in ML and social data science to develop new constructs and measures that can help delineate the scope of digital well-being.¹¹ Legal scholars and ethicists will find that their expertise is needed to address the questions relating to data governance, which will emerge alongside the growing interest in more personalised human-computer interaction. These different priorities, however, should not suggest the need for a strict division of labour, as the issues and possible solutions are inherently

¹¹ There is also a vital role here for philosophers of science (see Alexandrova 2017).

interdisciplinary. It is to be hoped that this review will serve as a starting point for other interested parties to become involved and help to deliver on the promise of digital technologies that promote flourishing for all.

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Appendix: Methodology

The analysis began by searching four databases (SCOPUS, IEEEExplore, PhilPapers, and Google Scholar). Figure 1 provides the generic form of our search query, which was adapted to the specific syntactical requirements of each search engine and run on the 25th October 2018. For SCOPUS and IEEEExplore, the search string was restricted to Title and Keywords to ensure the return of the most relevant papers. For IEEEExplore, the “AND ("ethic*" OR "moral*")” portion of the string was omitted due to limited results with the full string, and so the filtering of papers to those dealing with ethical issues was performed manually during the second stage. No other filters or restrictions were employed (e.g. date range).

Fig. 1 a generic form of the search query used and the results by search engine

("wellbeing" OR "well-being") AND ("ethic*" OR "moral*") AND ("technology" OR "comput*" OR "IoT" OR "artificial intelligence" OR "gam*" OR "smart*" OR "mobile" OR "ICT" OR "recommend* system*" OR "internet" OR "social media")

* indicates a wildcard operator (e.g. "gam*" will return results with either "gaming" or "gamification" and "ethic*" will return results with "ethics" or "ethical").

Results by Search Engine:

- SCOPUS (Title and Keywords: 164 results)
- IEEEExplore (Title and Keywords: 102 results)
- PhilPapers (71 results)
- Google Scholar (approximately 114,000 results returned, first 100 saved)

This search returned a total of 437 records, which were then screened in two stages. The first stage removed duplicate entries, records in a non-English language, and citations for which no document could be obtained. The titles and abstracts were then assessed for relevance based on the criteria highlighted at the start of this section. A total of 263 records were excluded at this stage. The remaining 179 records were read in their entirety, looking for relevant phrases, arguments or discussion points which address some ethical issue related to digital well-being. The themes were identified *ex post* during the analysis, rather than using a pre-defined thematic framework that restricted inclusion of relevant themes.

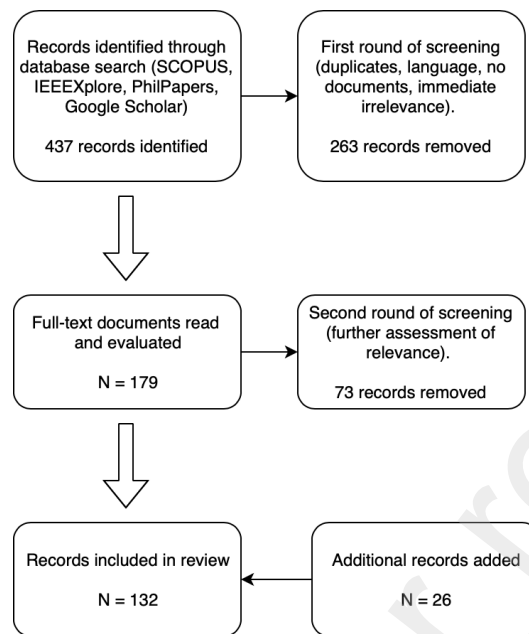


Fig. 2 a flowchart indicating the stages of our review

The concept of ‘well-being’ and its variants (e.g. ‘welfare’, ‘happiness’, and ‘flourishing’) are widely used (often indiscriminately), and play various roles depending on the disciplinary context. As such, one expected to find a large number of studies that were of no direct relevance to our review, but which were returned due to overly liberal use of the term ‘well-being’. In addition, the goal was not to provide a meta-analysis of empirical studies that sought only to establish whether some digital technology impacts well-being, according to some measure of well-being.¹² Therefore, a second round of exclusion was also conducted to remove records that did not raise some ethical issue pertaining to well-being and digital technology, leaving 106 records in total from the initial search query. Finally, 26 records were also added that were known to the authors prior to carrying out the review, and which offered additional perspectives on the themes raised by the original search results. Therefore, a total of 132 records formed the basis of our review.

¹² Although empirical studies of this kind may have ethical significance, it is beyond the scope of this article to perform the necessary analysis on which to base any substantive conclusions.

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