ESRC Review: Health and Well-Being

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Abstract and Keywords

This chapter describes the analyses and results for the ESRC Domain of Health and Well-Being, guided by a three-part main question: “whether technology makes us healthier, better educated, and more productive.” It first provides an initial overview of the major insights from the literature review and analysis, the Delphi surveys, and workshop discussions about the relevant range of the concepts of health and well-being in a digital age. The resulting focus is initially mostly about the technology but later on users, health, and research. Eight main topics emerged, including health care, measures and measurement, mobile and smartphone devices, social support, and weight loss. The analyses also highlighted theory, methods, and approaches in the literature, showing a relatively even distribution of deductive–inductive approaches and quantitative–qualitative approaches, using several well-known theories from psychology (e.g., theories of behavior change) and sociology (social networks). The review provides examples of literature from the project’s study period that illustrate these topics. The chapter concludes with a discussion of future research directions (e.g., cross-platform or holistic assessments examining the effects of broad, everyday digital technology use on health and well-being) and research challenges (e.g., methods, rapid change in health care technology, big data for health, and linking of personal and clinical health data with well-being outcomes).

Keywords: digital technology, ESRC Review, health, health care, mobile and smartphone devices, psychology, social networks, social support, sociology, weight loss

Introduction

THIS chapter provides an overview of the results from analyses of the literature, the Delphi process, and any relevant workshops for the Health and Well-Being domain. The initial ESRC scoping question for this area of work was: “whether technology makes us healthier, better educated, and more productive?” We first explore the results of the various digital humanities analyses of the literature and the review of methods and theory,

and then set out the results of the Delphi process. We compare these results, and we conclude with recommendations for areas of future study.

Initial Comments

This domain generated the largest set of literature of all. This appears to reflect disciplinary differences with other domains. Much of the literature was within health studies and health research journals. There was a stronger tendency to report experimental and empirical findings and there were far fewer general reviews. The responses to the Delphi process focused on health and mainly health-based, well-being issues but not much on the education element. We have also bracketed off the productivity issue in the health domain as this was extensively addressed in the Automation Workshop and therefore is presented in chapter 24. Workshops we ran with stakeholders via the UK Digital Leaders network focused on two main areas: health inequalities and access to digital technologies and privatization of health delivery through digitization. As a result, the one element of (p. 58) the ESRC brief that is under-represented here is the question, “Does digital media make us better educated?” We would argue that in relation to formal education this area is well served by work on educational technology, so that issue is not analyzed here. In regard to informal learning and also the specifics of both basic and complex digital skills—digital literacies—this issue clearly runs through many of the chapters and analyses in this volume.

Literature Analysis

Topics

As with the other literature analysis chapters in this volume, we aimed to identify two sets of data. The first was key concept pairs and topics within the existing literature. This allowed the comparison with areas of importance identified by the Delphi review. The second was a content analysis of the literature to explore the predominance of specific theories, methods, and approaches.

The 11 most common concept pairs identified in the Round-1 literature are listed in Table 3.1. These represent the topics covering 2% or more of the identified cases. Table 3.2 lists the main and second (sub) concepts identified.

Table 3.1 Analysis Concepts Ranked

Concepts	Percent
Disease	7.3
Body	4.6
Care	4.0
Health	3.8
Behavior	3.7
Loss	3.3
Activity	3.2
Network	2.6
Communication	2.4
Child	2.2
Intervention	2.1

Note: Topics occurring in at least 2% of the cases.

Table 3.2 Concept Pairings—Main and Secondary Concepts

Concepts	Percent	Concepts	Percent	Concepts	Percent
disease	**18.60**	**health**	**9.66**	**communica-tion**	**6.14**
outbreak	6.26	promotion	9.66	conflict	1.91
prevention	4.59	**loss**	**8.47**	mail	.95
sufferer	1.07	weight	8.47	stress	3.28
surveillance	6.68	**activity**	**8.17**	**behaviour**	**9.36**
body	**11.69**	conduct	2.09	counselling	3.10
device	2.44	isolation	1.25	recycling	2.03
embodiment	2.15	leisure	1.13	smoking	3.58
mass	3.22	pedometer	1.31	taxonomy	.66
mother	.95	sport	2.39	**child**	**5.66**
object	1.91	**network**	**6.56**	donation	1.13
self	1.01	outbreak	1.43	mother	4.53

care	**10.26**	rice	.89	**intervention**	**5.43**
caregiver	3.22	stress	2.92	mobile	1.91
clinic	2.74	vaccination	1.31	vegetable	3.52
follow-up	4.29				

Note: **bolded** term is the main concept; the unbolded terms below that and above the line are the related subconcepts.

Figures 3.1 and 3.2 display the changing nature and frequency of concept pairs from the periods 2000–2004 and 2012–2016.[1] Clearly the focus in the early period was on the technology (computers, system, information, Internet, data, navigation, space, robot, phone) with some relationships with people (user, scientist, and group), and only an emerging focus explicitly on the health context (care, health, support, intervention, (p. 59) effects, weight). By the later period, the most frequent concepts involve health (health, care, intervention, participant, patient, group, support) with the most frequent concept pairs involving those items, and then some emphasis on research (study, intervention, analysis, data, control, outcome, effect, trial).

Figure 3.1 Health and Well-Being 2000–2004: Most frequent concept pairs.

Figure 3.2 Health and Well-Being 2012–2016: Most frequent concept pairs.

All the literature collected from both rounds was analyzed using Wordstat. Wordstat identified 18 topics, presented in Table 3.3.

Table 3.3 Wordstat Analysis of Topics

Topic	Keywords	Eigenvalue	Freq	Cases	Cases (%)
Educational technology	LEARN; STUDENT; TEACHER; LEARNER; EDUC; COLLABOR; TECHNOLOGI	9.38	21,504	752	92.7
Health care	CARE; HEALTH; PATIENT; MEDIC; INFORM; PRACTIC; PROFESSION	2.97	54,753	775	95.6
Measures	ITEM; SCALE; MEASUR; SCORE; WA; QUESTIONNAIR; ASSESS	2.35	25,758	759	93.6

Social support network analysis	WEAK; TIE; TI; NETWORK; SUPPORT	2.26	13,485	739	91.1
Mobile devices	MOBIL; DEVIC; PHONE; APP; DIGIT; MONITOR; TRACK	2.11	11,251	680	83.9
Weight loss	WEIGHT; LOSS; OBES	2.00	4616	419	51.7
Ethnicity and gender	ETHNIC; GENDER; AG; STATU; BLACK	1.88	7575	640	78.9
Disease outbreak surveillance	OUTBREAK; SURVEIL; DISEAS; INFECT; INFLUENZA; VACCIN; UENZA	1.86	6349	469	57.8
Stopping smoking	SMOKE; CESSAT; SMOKER	1.71	2363	183	22.6

Efficacy	EF; CACI; FECT	1.68	2798	304	37.5
Family	MOTHER; INFANT; PARENT; CHILDREN; BODI	1.66	3764	537	66.2
Product quality	HEDON; BEAUTI; USABL; PRODUCT; QUALITI	1.61	5776	634	78.3
Social media	FACEBOOK; MEDIA; TWITTER; SOCIAL; SITE; BLOG; POST; SHARE; CONTENT	1.54	23,283	746	92.0
Hypertension	PRESSUR; BLOOD	1.52	1537	269	33.2
Chronic diseases	CHRONIC; PAIN; DISEAS; ILL	1.48	3190	452	55.7

Palliative care	PALLI; TELE-CONSULT	1.46	510	25	3.1
Activity	ACTIV; TECH-NIQU; AR	1.45	22,405	764	94.2
Controlled trial	TRIAL; INTER-VENT; RAN-DOM; CON-TROL	1.42	17,838	677	83.5

Table 3.4 Comparison between Concepts and WordStat Topics

Concept/ Topic	Disease	Body	Care	Health	Behavior	Loss	Activity	Network	Communication	Child	Intervention
Palliative care	X		X								
Stopping smoking				X	X						
Hypertension				X							
Efficacy											
Weight loss		X				X					

Chronic diseases	X										
Disease outbreak surveillance								X			
Family										X	
Product quality		X									
Ethnicity and gender											

Controlled trial										
Mobile devices		X								X
Social support network analysis								X		
Social media									X	
Educational technology									X	

Mea-sures											
Activi-ty							X				
Healt h care			X								

As we can see in Table 3.4, there is a good overlap between the two analyses. We would argue that the analyses point to literature that is focused on the use of digital technologies and social media in three main areas. First, monitoring and supporting individuals in changing health behaviors (such as weight loss or stopping smoking); second, using digital technologies to monitor and support patients with chronic illness (e.g., hypotension); and third, using digital technologies to support health communication or as part of health support communities.

Separate from this, the literature is focused on the measurement and evaluation of the efficacy of such interventions. This evaluation fits with the content analysis on methods and theory that follows. A section of the literature also included work on educational technology with some crossover to technologies to support health education.

Six key areas stand out from the analysis (Table 3.3): educational technology, health care, measures and measurement, mobile and smartphone devices, social support, and weight loss. As noted earlier, we put the “educational technology” issue to one (p. 60) side, except where it overlaps with issues of health and well-being. In the following sections we consider some examples of how these issues have been examined in the recent literature.

Health care. Work on the interaction in health care provision between social, occupational, and organizational roles and digital media has a long history. For example, Aydin and Rice (1991) argued that membership of specific occupational and departmental social worlds can help to explain attitudes toward medical information systems within health care organizations. They noted that

> Physicians, for example, expected involvement in decision-making and felt the system had become primarily an administrative system, while other medical employees were more concerned with computer use as infringement on their patient care activities.
>
> (p. 132)

More recently the focus has moved to the role of digital systems in the range of health services including public health and personalized health. The analysis by the University (p. 61) of Sheffield shows that literature before 2004 had a stronger emphasis on information systems and users, whereas more recent work has focused on care, intervention, and health information for patients. For example, Bennett and Glasgow (2009) discuss advantages in public health interventions conducted via the Internet and Web 2.0. Within this domain they point out that there are also challenges, such as reach (access), sustainability of effects, reporting in standardized measures, and attrition. Bennett and Glasgow argue that these challenges could be overcome with more tailored messages and greater use of social networking functions. This shift from a system focus to a user or “person” focus can be found in a lot of the literature on digital media use. This represents a shift from the novelty and specifics of technologies to the integration of these into everyday practice. ennett and Glasgow see advantages for digital media in reach and efficacy in health-related interventions, as “Internet-based implementation allows participants to ac-

cess intervention content at their convenience, in a manner that can feel largely anonymous" (p. 276). Combined with available data, "Internet interventions can be structured to provide highly personalized messages" (p. 276). As digital technologies (p. 62) often have low marginal costs, providing specific services can be undertaken while lowering costs. As a result they conclude that

> [g]iven their potential for low costs, scalability, adaptability, and effectiveness, Internet interventions may be appropriate for dissemination to a range of settings (e.g., health systems, health plans, employers, municipalities). However, each of these settings varies considerably with regard to their resources, expertise, interest, and ability to implement Internet interventions independently.
>
> (p. 279)

(p. 63) (p. 64) This shift also reflects the rise of new digital forms such as social media. For example, Chou et al. (2009) pointed out that US-based health-related communication programs, which seek to impact population health (such as smoking cessation and dietary interventions), should consider carefully key social factors when looking to communicate via social media. They argue that

> social networking sites by far attract the most users, making them an obvious target for maximizing the reach and impact of health communication and eHealth interventions.
>
> (p. 9)

In looking specifically at communication around cancer they found that among family members who had cancer, there was a high prevalence of Internet and social media use. This therefore made social media a potentially fruitful route to "'secondary audiences,' that is, caregivers, family, and friends of cancer patients" (pp. 9–10). Thus they concluded that "social media promise to be a way to reach the target population regardless of socioeconomic and health-related characteristics" (p. 10).

Househ et al. (2014) also explored the role of social media, in community empowerment in US health care contexts. They argued that

> there is a promising future for social media in community engagement, information sharing, data collection functions, appointment setting, prescription notifications, providing health information, engagement of the elderly, improved participation, autonomy, motivation, trust, and perceived self-efficacy.
>
> (p. 56)

On the other hand, they point out key challenges related to the use of social media for health care, such as

> privacy, security, the usability of social media programs, the manipulation of identity, and misinformation. These factors can pose serious threats to patient safety if not addressed appropriately by those who wish to engage patients through social media.
>
> (p. 56)

Measures and measurement. Another theme in the literature is the interplay between using digital media derived data, using digital tools to collect data, and measuring the impacts of digital media use or digital media interventions in the health context. Very often these three elements are combined. In the early 2000s the focus around measurement appears to be on tools such as Internet surveys. For example, Eysenbach and Wyatt (2002) examined the use of the Internet to conduct research as well as other parts of the analysis. They provided recommendations for implementing Internet-based surveys as well as emphasizing ethical considerations. They focused on Internet survey methods and did not address the use of "big data" nor data scraped from social media, issues that have become more prevalent in recent years. But two of their key warnings are still very relevant:

> In 'open' surveys conducted via the Internet where Web users, newsgroup readers, or mailing list subscribers are invited to participate by completing a questionnaire, (p. 65) selection bias is a major factor limiting the generalizability (external validity) of results … The ethical issues involved in any type of online research should not be forgotten. These include informed consent as a basic ethical tenet of scientific research on human populations, protection of privacy, and avoiding psychological harm.
>
> (p. 4)

As noted earlier, the analysis of the literature sees a strong shift towards issues of digital media in health interventions. For example, Glasgow (2007) examines the measurement and assessment of eHealth intervention and behavior change programs and provides recommendations on design, measurement, and methods, concluding with four main recommendations, First, explore outside of research silos, meaning work across different illnesses taking into account multiple variables. Second, explore the role of human support, which could be the most important contextual factor. Third, tailor experiment design and reporting criteria to eHealth questions, meaning that they have to be interactive, user-centered, dynamic, and evolving. Fourth, follow translation and diffusion theories of technology uptake and innovation. They point out that

> [t]he majority of evidence-based health care procedures fail to translate into practice. Part of the reason for this failure to translate is because of the research methods most often used to evaluate interventions. In particular, typical designs do not address external validity concerns or provide information relevant to policymakers or to those considering program adoption.

(p. 120)

He concludes that “eHealth is complex, contextual, evolving, and has effects at multiple levels. The designs and measures for eHealth research need to have these same characteristics” (p. 125).

Given the nature of this domain, the focus of many papers is on the empirical evaluation of specific digital interventions from bespoke digital tools to general social media campaigns. Often these involve the application of a digital media format to a specific health intervention. One example is provided by Coyle and Doherty (2009), who examined the use of a 3D computer game developed to support adolescent mental health interventions. This was a goal-oriented computer game that adolescents and therapists could play together in sessions. In the evaluation, the shortcomings that therapists mentioned are applicable to many digital technology interventions. These included an over-reliance on literacy skills, lack of engagement with the specific technology, and a need to adapt to clients’ needs (for example, choosing more suitable characters). As we have noted elsewhere in this volume (especially chapters 18, 19, and 20), issues of digital literacy and digital efficacy underpin many aspects of digital media use. Having noted these shortcomings, Cole and Doherty argue, “The initial clinical evaluation of [the game] has provided evidence that computer games have the potential to assist therapists working with adolescent clients” (p. 2058). But they add that

> [f]uture projects in the MHC [mental health care] domain may benefit from more rigorously applying traditional user-centered requirements gathering techniques. However, the problem of access to clients by HCI researchers still remains. (p. 66) Techniques are required which help HCI researchers to gain access to the tacit knowledge of MHC professionals.
>
> (p. 2058)

Such work points out a challenge found in many other domains (e.g., social care, government policy interventions, etc.), where existing design and evaluation tools are designed around existing practice and need to take on methods from digital and computer science disciplines. Coyle and Doherty also note that development and evaluation of digital systems is time-consuming; therefore “systems should aim to be useful to a broad range to therapists, in a broad range of settings and with a broad range of clients” (p. 2059).

Not only are digital media forms (e.g., games and social media) being applied in health settings, but also digital devices are now key to monitoring and evaluating health, both personal (e.g., wearables) and public (e.g., environmental monitoring and sensors). Again the number and range of papers in this area is vast. An example from our corpus is Pantelopoulos and Bourbakis (2008), who reviewed the research and development of wearable biosensor systems for health monitoring. These can provide low-cost unobtrusive solutions for continuous all-day and any-place health, mental, and activity status monitoring. The article outlines the technical challenges of these technologies. As with many other evaluations in this area, they found that many of the systems in fact remain poorly de-

signed for wearability, for many practical reasons to do with size, weight, and complexity. Alternatively, they propose that integration of these tools into clothing and textile modules is an efficient alternative approach, though it has the disadvantage of being less scalable. There is then a tension between scalability (e.g., mass availability) and wearability. As with other digital technologies in the medical domain, security is a key concern. They concluded that "integration of proper encryption and authentication mechanisms is required to ensure privacy and security of personal health data" (p. 4890).

Mobile and smart phone devices. Over the same period, mobile and smartphone devices have increased in popularity globally. They clearly have become a major target for digital health solutions from health and activity monitoring to information and advice to supporting behavior change. It is unsurprising therefore that this is a topic identified in the literature. For example, Dennison et al. (2013) argue that young, currently healthy adults have interest in apps that attempt to support health-related behavior change. The factors that most influence their app use were accuracy and legitimacy, security, effort required, and immediate effects on their mood and well-being. However, they point to drawbacks, such as context skepticism and security and privacy of health-related data, especially keeping control over what apps can do with the user's health data. Dennison et al. raise doubts "around whether users will use behaviour change apps for long periods of time, a critical issue that will affect the effectiveness of many behavior change apps" (p. 8). As was noted in the work on wearables, there are concerns about usability and accuracy. Dennison et al. noted that "participants lacked faith in the accuracy with which a smartphone could sense relevant states (e.g., mood, activity levels) (p. 67) and expected that incorrect and irritating suggestions would make them mistrust the app and cease using it" (p. 9). Importantly, this work identified concerns among users as to whether health apps were linked to digital media such as social networks.

One of the areas of intervention in the literature is that of self-diagnosis. As an example, Lupton and Jutel (2015) analyzed the way lay people negotiated the use of self-diagnosis smartphone apps in mid-2014. Their main findings are that they represent a contested and ambiguous site for meaning and practice in relation to personal health. Importantly, they point out that many apps purport a level of medical authority that they may not possess, and that much of this is undertaken through the presentation of information and imagery related to broader societal discourse around "healthy living" (p. 131). As they note:

> Self-diagnosis apps (…) state and engage with the discourses of healthism and control that pervade contemporary medicine. They also participate in the quest for patient 'engagement' and 'empowerment' that is a hallmark of digital health rhetoric
>
> (p. 132)

Lupton and Jutel point out that the implied medical authority combined with the apparent accuracy of "algorithms" provides a basis for both their promotion and use. Yet the users themselves are well aware of their own status as "not medically qualified." The combination of both user uncertainty and, in some cases, the lack of robust medical evaluation

and transparent algorithms means that there remain many challenges to making such systems work. Such work highlights the challenge found elsewhere outside the health domain, that digital technologies disrupt (for good or ill) existing systems and in many cases both individual practice and necessary societal regulation may take time to catch up.

One area that is strongly prevalent in the literature is that of using mobile and smartphone devices to support patients with long-term (chronic) conditions. For example, Gollamudi et al. (2016) find that smartphones data allow these patients to make informed health decisions, though they point out that this changes the dynamics of health care relationships:

> [O]ne of the more intriguing aspects of this technology as a tool to enhance individual health is that data is collected, stored, and presented digitally without the need for direct interaction between the user and (as traditional) health professional.
>
> (p. 12)

Another area of work we noted in the literature and which may need to be better developed and formalized within the medical domain is the systematic comparison of digital solutions. For example, in the case of enhanced self-management of the chronic arthritic-like condition of gout, Nguyen et al. (2016) reviewed 57 mobile health apps. Very few apps met the internationally accepted gout management guidelines, with only one meeting all requirements. As noted previously, it is clear that more systematic work (p. 68) is needed to assess the viability of such apps. Nguyen et al. point out a range of limitations in the apps with regard to this specific condition, especially the lack of routes for accessing health care professionals, but still argue that

> [T]he use of mobile applications to support self-management of chronic conditions presents much potential. The extent to which such apps contain content consistent with treatment guidelines and are user-friendly is central to their likely adoption and effectiveness.
>
> (p. 71)

Social support. With the rise of social media, we also see a range of literature concerned with social support in health contexts. This work goes back to some of the earliest work around online communities with a focus on Internet fora. For example, Richardson (2004) explored issues of Internet use and heath debates across Cancer, SARS, and the debate about the measles/mumps/rubella vaccine and Autism. Such work has taken on much greater importance in recent years as citizens and patients have become able to engage others, often of like minds, on such issues via social media. This range of work is very broad and overlaps with research around online communities, issues of identity, and political debate where health issues are tied to policy issues. We will focus here on the more clinical health and well-being issues. As with other material discussed in this chapter, many of the publications evaluate a specific intervention or compare across technolo-

gy contexts, with foci ranging from perceptions to behavior change to the links between digital media use and health.

An example of comparative work is Barrera et al. (2002), who examined if diabetes patients change their perception about support following their participation in Internet-based support groups. The study finds that after three months of intervention, patients who participated in Internet-based social support significantly changed their views compared to those patients who had only participated in computer access to information about diabetes. This was achieved with patients who did not have previous experience with the Internet. In another comparative study, Barak et al. (2009) review the literature about Internet-supported psychological therapeutic interventions, conceptualizing them into four categories: web-based interventions, online counselling and therapy, Internet operated therapeutic software, and other online activities (e.g., as supplements to face-to-face therapy). They concluded that

> [T]he ability to develop feasible and effective alternatives by exploiting the Internet for clinical work—alternatives that suit many people and distress areas—should be regarded as broadening and expanding the availability of professional help, especially for those who feel comfortable in the virtual environment.
>
> (p. 14)

Such work highlights the conceptual challenge of tidying up the conceptualization of, and regulating and assessing different forms of, digital media-based interventions in the medical context.

Overall, much of the work in this area is not about direct clinical support interventions but rather about fostering patient and citizen empowerment in online support (p. 69) groups. As an example, earlier work by Barak et al. (2008) point out that online support groups encourage well-being, a sense of control, self-confidence, feeling of more independence, social interactions and self-image, loneliness, optimism, and mood state. Therefore, the authors argue that participation in online support groups can foster personal empowerment, which can help in dealing with feelings of distress, but do not necessarily help in producing therapeutic changes. These groups also have drawbacks, such as developing dependence, developing distance from interpersonal contacts, and experiencing uncomfortable situations which are part of online social interactions. Barak et al. argue that

> It seems that the basic factors identified by quantitative research, as well as by our qualitative study—impact of writing, expressing emotions, gathering information and improving knowledge, developing interpersonal relationships, and bettering decision-making skills—generate, each and all of them, a personal sense of empowerment.
>
> (p. 1878)

They conclude, however, that such groups are not a substitute for professional treatment where such clinical intervention is needed but can offer a complementary component to such interventions. Yet, there are always challenges in regard to communication, digital skills, and competences in such circumstances. These may interact with and influence both outcomes and well-being in and of themselves. Wright et al. (2013) argue that interpersonal motives, increased face-to-face communication, communication competence, and computer competence can predict whether college students are feeling more depressed. One of the most important skills to reduce depression was found to be communication competence, which is a set of skills that enable college students to mobilize social support in a better way.

Weight loss. One area that brings all these issues of health care, social support, device use, monitoring, measurement, and personal digital technology use is that of weight loss. This is a domain where online groups, digital media, and apps have all been both promoted and critiqued as routes to intervention (or not). It is not unsurprising then that this has been highlighted as one of the few specific health topics in the analysis of the literature. One immediate question is the extent of the link between digital media use (or at least data on digital media use) and the prevalence of obesity. For example, Chunara et al. (2013) examined the relationship between online social environments via web-based social networks and population obesity prevalence. Their main finding is that activity-related interests (such as television watching as opposed to sports) across the United States and neighborhoods in New York City were significantly linked with obesity. They argue that their study

> corroborates the association of social environments and obesity, and also begins to uncover aspects of the environment, such as interests in the online medium, and how they are positively or negatively related to this outcome. Sharing of these norms through Facebook may also be magnified because network connections are ‘friends’; people who likely share demographic profiles, meaning there messages are better focused.

(p. 70) Issues of digital self-monitoring are also found in the literature. Steinberg and others (2013) examine the impact of weight loss interventions that focus on self-monitoring digital techniques such as “smart scales” (which displayed current weight and sent it directly to a website), a web-based weight loss graph, and weekly tailored feedback via emails. These interventions have proved to be successful when combined with other intervention elements. They found that

> a lower intensity weight loss intervention that focused on daily self-weighing as the main self-monitoring strategy and also included emailed tailored feedback and skills training with no regular face-to face-contact or focus on self-monitoring of diet and physical activity behaviors produced clinically significant weight losses.
>
> (p. 8)

With regard to mobile and smartphone interventions, Svetkey et al. (2015) examined the efficacy of mobile health weight loss intervention apps in young adults: smartphone self-monitoring, or personal coaching enhanced by smartphone self-monitoring (PC), compared with a control group. They concluded that digital interventions were not successful. This lead them to the conclusion that a combination of methods, both digital and social support of human interaction which are adaptive can be more beneficial. The researchers found that relative to the control group: “neither a mobile app alone nor personal coaching with mobile self-monitoring resulted in statistically significant weight loss after 24 months” (p. 2139). Like many other studies, they concluded that iterative and rapid development and testing of health interventions in context are needed to ensure the best outcomes.

Summary. We would argue that there has been a shift in focus from health care technologies, to interaction with health care technologies, to a greater focus on the role of digital technologies in intervention, especially in regard to health behaviors and perceptions. Where the focus is on non-clinical and community interventions, there is notable overlap with the literature around digital communities. In regard to digital clinical interventions from this selection of literature, it is clear that much more work is needed on the veracity, development, and regulation of such tools.

Theory, Method, and Approach

As with the other review chapters, this analysis builds on Borah (2017). A slight majority of the analyzed papers (52%) were deductive, applying existing theory (Table 3.5). Nearly (p. 71) half of papers utilized primary collected data (48%), with 43% of the papers using secondary data (Table 3.6). In line with the focus on health interventions and health behavior, the main disciplines from which theory was used or for which theory was developed were psychology (50%), sociology (19%), health studies (8%), communication and media (8%), and information studies (5%). There was considerable variety in the specific theories applied from these disciplines. Theories of behavior change, social cognition, and planned behavior (each 8% of total) were the main theories in psychology studies, while social network analysis was the most frequent theory (2% of total) in sociology articles.

There was a fairly even split between statistical and qualitative approaches (Table 3.7). For those items that undertook empirical research, the main research methods were predominantly quantitative: experiments or comparisons (19%), surveys (11%), social network analysis (3%), and meta-analysis (4%) (Table 3.8). The majority of the empirical work focused on specific groups, but with a larger proportion of general population studies (31.5%) than in the other domains (Table 3.9). Less than 2% of the work described itself as using a “big data” approach.

(p. 72) Table 3.5 Epistemological Approach

	Percent
Deductive (testing of existing theory)	51.5
Inductive (conclusions driven by data)	48.5

Table 3.6 Empirical Approach

	Percent
Primary empirical (data collected and analyzed)	48.0
Secondary empirical (analysis of existing data)	43.4
Discursive/descriptive (no new data or theory)	8.2
Theoretical (synthesis of current or prior work)	.5

Table 3.7 Analytic Approach

	Percent
Qualitative (textual—non-discourse)	48.4
Statistical (numerical)	42.6
Not applicable	8.3
Discourse (textual—linguistic-discourse)	.7

Table 3.8 Research Method	
	Percent
Literature Review (general or narrative)	28.6
Other	22.0
Experiment	18.8
Survey	10.8
Interview(s)	6.6
Content analysis	4.5
Meta-analysis or systematic review	3.3
Social network analysis	2.6
Focus groups	2.0
Textual (linguistic-discourse analysis)	.4
Ethnography	.4

Table 3.9 Study Population	
	Percent
Specific group	53.8
General population	31.5
Not applicable	12.8
Case study (studies)	1.9

This domain is notably different than the others in two clear respects. First, the number of published papers by identified authors was much higher, and second, the majority of these reported quantitative empirical studies. Much of the work was broadly psychological and focused on the role of digital technologies in supporting or driving health behavior changes. This is reflected in the main theories identified in the literature. Unlike the

other domains, there is a limited amount of reflection on the broader social or health impacts of digital media.

Delphi Review

This section provides details of the results of the Delphi process for the Health and Well-Being domain, covering suggested scoping or research questions, key topics to address within these questions, and key challenges to researching these questions.

Future Research and Scoping Questions

The Delphi review identified a set of scoping questions for the domain, which were coded into four categories: design for positive health impacts of digital technology use; health behavior and using digital technologies; health user needs; and negative health impacts of digital technology use (Table 3.10). Their ranked importance from the confirmatory survey is given in Table 3.11. It is important to note that ranked importance is almost the inverse of the number of questions allocated to the category.

Table 3.10 Delphi Review Scoping Questions

Question category	**Example questions**
Design for positive health impacts of digital technology use	What types and amounts of technology make us healthier, better educated and more secure? How can we design technology assist in making us healthier, better educated and more secure? How can we design technology to support us being healthier and thrive psychologically? What are the best practices/processes in the design of technology that will make us healthier, better educated and more secure?
Health behavior and using digital technologies	How do people engage with technology to improve health and well-being? You could extend well-being to personal and social well-being What motivates people to be healthier, better educated and more secure, and how can these motivational drivers be incorporated into technology?
Health user needs	What are the factors that lead to development of health information technology programs that meet the needs and capacities of different users? How can research be used to guide the strategic development of health information technology programs that meet the needs of different users? How can we engage different technology users in developing and implementing strategic health information systems that will meet their health information and support needs?

Negative health impacts of digital technology use	What isn't asked here though is if technology is also hurting health. I.e., is it replacing going to the doctor, moving around (not just sitting in front of a computer all the time), too much sitting, lack of social ties, etc.? Does the use of digital technology contribute positively to our health and well-being?

Table 3.11 Delphi Review Scoping Questions Ranked by Importance

Question category	Percent
Design for positive health impacts of digital technology use	30.8
Health behavior and using digital technologies	30.8
Negative health impacts of digital technology use	20.5
Health user needs	17.9

(p. 73) The consultation workshop found these scoping areas too broad and noted that the issue of "design" created a focus on devices and away from a more holistic view of societal health and well-being. The workshop suggested other scoping areas or questions. These include that more should be done to understand the role of digital technologies in health inequalities (do they help to alleviate, reproduce or deepen these inequalities?) and to link educational technology and health (for example, to think about learning (p. 74) about well-being and the role of digital technology in this). The workshop also suggested addressing the governance of digital health technologies and the need for detailed systematic evidence of the impact and lived experience of everyday health technologies (e.g., fitbits). Finally, they recommended looking at the broader socio-economic and technical challenges of "joining up" health providers and services through digital technologies, and examining more questions of health and well-being in the digital workplace.

The topics identified in the Delphi review were then coded into 11 categories as detailed in Table 3.12, with their ranked importance from the confirmatory survey are presented in Table 3.13. As with the scoping questions, those topics that were most (p. 75) commonly cited in the Delphi workshop were not those deemed most important in the review. The four most frequent were device, environment, and service design; benefits and harm from digital technology use; health communication; and education. Benefits and harm from digital technology use received by far the highest importance ratings, followed by health communication and privacy.

Table 3.12 Key Topics Ranked by Percentage of Delphi Survey Responses

Topic	Percent
Device, environment and service design	31
Benefits and harm from digital technology use	15
Health communication	15
Education	10
Device and service design	5
Digital literacy	5
Other	5
Preventative and long-term condition support	5
Digital divide	3
Organizational change	3
Privacy	3

Table 3.13 Key Topics Ranked by Importance from Delphi Survey

Topic	Very important	Important	Neutral	Unimportant	Very unimportant
Benefits and harm from digital technology use	76.9%	23.1%	0.0%	0.0%	0.0%
Health communication	46.2	46.2	7.7	0.0	0.0
Privacy	46.2	38.5	7.7	7.7	0.0
Device, environment, and service design	38.5	53.8	7.7	0.0	0.0
Preventative and long-term condition support	38.5	46.2	15.4	0.0	0.0
Digital divide	38.5	30.8	15.4	15.4	0.0
Digital literacy	30.8	38.5	23.1	7.7	0.0

Organizational change	7.7	76.9	15.4	0.0	0.0

The consultation workshop identified a set of additional potential topics within the health care domain. These were: what are “healthy” environments or “life worlds” and what role can digital technologies have in these; how do or can digital technologies help people to generate their own definition of a healthy “lifeworld”; and finally, understanding the impact of major digital platforms on behavior, perception of health and well-being, and routes to health information.

Research Challenges

The challenges in undertaking research in this area identified by the Delphi panel were placed into seven categories. These categories are detailed in Table 3.14 and ranked by the percentage of coded items. The ranking of these by the confirmation survey are presented in Table 3.15. The methods category was twice as frequent as the next category, processes of co-design, followed by collecting and accessing data. Methods were also rated as the most important challenge, followed by rapid changes, big data for health, and interdisciplinarity.

Table 3.14 Challenges Ranked by Percent of Cases

Challenge	Percent
Methods to analyses digital health	46
Processes of co-design	21
Collecting and accessing data on digital health	14
Rapid change in digital and health technology	7
Big data for health	4
Education	4
Interdisciplinarity	4

Table 3.15 Challenges Ranked by Importance from Delphi Survey

Challenge	Very important	Important	Neutral	Unimportant	Very unimportant
Methods to analyze digital health	61.5%	30.8%	7.7%	0.0%	0.0%
Rapid change in digital and health technology	38.5	61.5	0.0	0.0	0.0
Big data for health	38.5	46.2	15.4	0.0	0.0
Interdisciplinarity	38.5	46.2	15.4	0.0	0.0
Collecting and accessing data on digital health	30.8	61.5	7.7	0.0	0.0
Processes of co-design	30.8	46.2	15.4	7.7	0.0

The consultation workshop agreed with the challenges identified by the Delphi process, in particular focusing on “big” health data, personal and commercial uses of health data, linking personal and clinical health data with well-being outcomes, governance in digital health care, and digital technologies’ role in the rich pathways of health and social care.

Combining this broad range of ideas with the material in the literature provides a clearer picture. The next section undertakes this reflection.

(p. 76) Conclusion

As in the Communication and Relationships (chapter 8), and the Communities and Identities domains (chapter 14), much of the work in the Health and Well-Being domain appears to be focused on specific technologies, in this case the use of bespoke or platform technologies to impact health behavior. There are few if any examples of cross-platform or holistic assessments examining the effects of broad, everyday digital technology use on health and well-being. There were also clear crossovers with the Communication and Relationships (see chapter 8) and the Communities and Identities domains (see chapter 14). Much of the work involved aspects of health communication supported by digital technologies, or at least interaction with digital technologies that afforded aspects of patient-carer-doctor-service interactions. There were also a good number of cases focused on the role of online health support communities. Health and well-being may therefore be a context for applied communications and community research.

To summarize, the majority of the literature in the Health and Well-Being domain is focused on the evaluation of digital health technologies. There appears to be a limited literature on the broader question of the impacts of digital lifestyles on health and well-being and limited work on the negative impacts of the digital technologies. Moreover, the broader social questions identified in the Delphi work and consultation workshops that appear to go beyond the literature include the following:

- Understanding and addressing the governance of digital health technologies
- Need for detailed systematic evidence of the impact and lived experience of everyday health technologies (e.g., fitbits)
- Questions of health and well-being in the digital workplace
- (p. 77) Digital technologies and health communication and health behavior change
- Broader socio-economic challenges and issues in “joining up” health providers and services through digital technologies

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Notes:

([1.]) As part of the review, The Digital Humanities Institute at the University of Sheffield applied concept modelling techniques to a curated corpus of 1,900 journal articles from the period 1968 to 2017. Concept modelling is a computational linguistic process that involves identifying the emergence of concepts, or key ideas, via lexical relationships. For the purposes of the review, lexical relationships were limited to high frequency co-occurrences of terms as pairs and trios. The process is entirely data driven and resulted in 2 million rows of data. The website https://www.dhi.ac.uk/waysofbeingdigital/ provides access to the top 50 most frequently occurring pairs and trios through a series of data visualizations. Click on *View Data Visualizations* at the top. Then check/submit which of the seven ESRC domains you are interested in (including all). Then choose the visualization. These show configurations across selected time frames. Choose bubble chart, tree map, zoomable pack layout, or network diagram, by individual subject or by all seven subjects combined, by document or concept frequency. You can similarly search the analyzed documents (all, by subject, author, concept, concept trio, and year) by clicking on *Browse Ar-*

ticles at the top. Also, see https://waysofbeingdigital.com/literature-analysis-interactive-results/ for interactive visualizations with mouse-overs of the main clusters of concepts within each domain, and the relative frequency of concepts associated with each cluster.

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