

From the
Institute for Medical Information Processing, Biometry and Epidemiology (IBE)
of the Ludwig-Maximilians-Universität München
Director: Univ. Prof. Dr. Ulrich Mansmann

**Web Accessibility and Mental Disorders:
Difficulties Experienced by People with Depression and Anxiety
on the Web**



Dissertation
zum Erwerb des Doctor of Philosophy (Ph.D.)
an der Medizinischen Fakultät der
Ludwig-Maximilians-Universität München

submitted by
Renaldo Bernard
from
Bridgetown, Barbados
on
November 14, 2019

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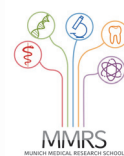
List of Abbreviations

AI	Artificial Intelligence
ATAG	Authoring Tool Accessibility Guidelines
BETTER	Web accEssibiliTy for people wiTh mEntal disoRders
DA	Depression and anxiety
ISO	International Organization for Standardization
MD	Mental disorder
MHP	Mental health practitioner
ML	Machine Learning
PwMD	People with mental disorders
SMI	Severe mental illness
UAAG	User Agent Accessibility Guidelines
USA	United States of America
W3C	World Wide Web Consortium
WAI	Web Accessibility Initiative
WCAG	Web Content Accessibility Guidelines
YLD	Years Lived with Disability



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1 Introduction

1.1 Background

1.1.1 The Web and Mental Health

The Web is an essential resource for people living in modern and knowledge-based societies. It is used by more than half of the world's population and is increasingly being utilised in many new and exciting ways [2]. Web usage encourages fuller participation in various aspects of life and provides numerous conveniences and opportunities that were not possible before its existence [3]. People often access the Web to gather information that helps them make quick informed decisions [4], to develop relationships [5-7] and to engage in recreational activities such as online gaming, watching movies, shopping and listening to music [8, 9]. Castellacci and Tveito [3] groups these and other effects of Internet technologies, like the Web, on well-being into four broad categories: change in time use — more efficient management of social activities and everyday tasks (e.g., shopping, finances and automation services), introduction of new activities — new methods of creating and maintaining relationships (e.g., social networking platforms, online forums and collaborative platforms), increased access to information — more systematic information on products, services and other subjects of interest (e.g., real time information, up-to-date online scientific databases and rating/review systems), and constantly improved communication tools — increased opportunities for enhanced communication, especially at a long-distance (e.g., social networking platforms, knowledge-sharing platforms and online communities).

The Web is widely accepted as a major source of mental health support across the lifespan. Mental health-related information seeking online is useful for those pursuing a better understanding of their disorder and treatment options [10, 11], for informed discussions with health professionals and for gaining clarity after receiving difficult to understand information from health professionals [12]. Young people experiencing negative mood related symptoms have been found to seek help online before pursuing treatment offline [13]. Similarly, research shows that the willingness of people with suicidal thoughts to seek help via online sources increased, compared to a marked decrease in their willingness to seek offline sources

of help, as their risk level increased [14]. The intention to seek help online also appears resistant to external factors when compared to traditional help-seeking via offline channels, especially for young people [15]. Online social networking platforms have been instrumental in enhancing social connectedness among young people which has been linked to their increased ability to actively cope with victimisation and their increased likelihood to seek help [16]. Similarly the use of online social network platforms has also been correlated with increased community participation and civic engagement by older participants with mental disorders (MDs) [17]. The Web is also considered as an effective platform for convenient, personalised, accessible and self-directed treatment [10, 18]. For example, a recent meta-analysis found that the effectiveness of guided Web-based cognitive behavioural therapy may be equivalent to face-to-face therapy for social anxiety disorder, panic disorder, spider phobia and depressive symptoms [19]. These trends are anticipated to grow as levels of Web usage becomes increasingly comparable across various populations between those with and without MDs [11, 12, 20].

However, the Web has also proven to have potentially detrimental consequences for mental health. Computer-mediated communication, including social interaction via the Web, lacks important social information that helps regulate interpersonal interaction [21]. Such a situation coupled with a resulting heightened self-focus and less other-focus, increases the likelihood of uninhibited and aggressive communication exchanges on the Web [22, 23]. For example, this dynamic is believed to fuel what has been termed *cyber harassment* where perpetrators use online messages to negatively affect the reputations, relationships and psychological well-being of victims [24, 25]. Research [24] has found that cyber harassment victims are significantly more likely to report depressive and social anxiety symptoms than those who are not victims of cyber harassment. Compared to traditional harassment, harassment on the Web potentially exacerbates its effects given the widespread publicity, increased permeability and the seemingly infinite permanence that is characteristic of online messaging [26].

The Web has also been tied to other harmful effects. Researchers [27] have found it helpful to distinguish between dependence *on* Internet technologies and dependence *to* Internet

technologies. Griffiths [27] noted that Web users may capitalise on this Internet technology as a facilitator of problematic behaviours given the high degree of perceived anonymity and disinhibition afforded by the Internet. Whereas the latter point speaks to a potentially emerging separate classification that is analogous to existing addiction and impulse-control related MDs. For instance, where Web usage is characterised as a behaviour that displaces important everyday activities and duties in a detrimental way [28, 29] and is associated with other MDs including depression, anxiety disorders and substance-use disorders [30-32].

1.1.2 Burden of Mental Disorders

MDs are a significant public health issue due to the restrictions they place on participation in all areas of life and the resulting disruption to the families and societies of those affected. The diagnostic criteria associated with these conditions describe lived experiences of severe distress and functional impairment for individuals affected [33, 34]. Studies have shown that people with MDs report higher levels of unemployment, absences from work, at-work performance deficits and weak social networks when compared to the general population [35-38]. Family members often sacrifice their time, relationships and financial stability to care for loved ones diagnosed with MDs [39]. People who support people with MDs as caregivers often have a higher risk for a lower quality of life, including negative outcomes for health, education, work and relationships [40]. The combination of the above trends is foreseen to result in a substantial economic burden associated with the health and social service needs of those affected by MDs, the loss of employment and reduced productivity among people with MDs, and the negative impact on caregivers and of premature mortality.

Depression and anxiety (DA) are the most common MDs. Recent estimates [41] rank depressive disorders as the single largest contributor to non-fatal health loss globally given that these disorders account for 7.5% all Years Lived with Disability (YLD). Globally, 4.4% of the population has been estimated to be living with a depressive disorder, and Europe accounts for 12% of these cases. While anxiety disorders account for 3.4% of all YLD globally and consistently rank in the top 10 causes of YLD across all World Health Organisation regions. Latest estimates indicate that around 3.6% of the global population

suffer from an anxiety disorder and 14% of these cases are in Europe. Together, these MDs are more common among females globally where 5.1% of females compared to 3.6% of males suffer from depression and 4.6% compared to 2.6% from anxiety.

1.1.3 Web Accessibility and Mental Disorders

Web accessibility measures help ensure that people with impairments, such as those with hearing, visual and physical impairments, can use the Web [42]. Access to the Web requires having the necessary technological infrastructure available and the absence of barriers that make it difficult to perceive, understand, navigate, and interact with Web-based resources [42]. Article 9 of the Convention on the Rights of Persons with Disabilities upholds access to communications technology, such as the Web, as a fundamental human right that member states have committed to protect [43]. Many private and public efforts have been initiated worldwide to increase accessibility of the Web but none as globally accepted as the guidelines produced by the World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI) [44]. Fourteen governments including France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, United Kingdom, the United States of America, Australia, Canada, Hong Kong, India, New Zealand have all made compliance to WAI's Web accessibility guidelines a requirement for various types of information they provide to citizens [45]. The WAI has produced industry-supported guidelines focused on Web content design (Web Content Accessibility Guidelines - WCAG), publishing tools (Authoring Tool Accessibility Guidelines - ATAG), and user agents (User Agent Accessibility Guidelines - UAAG) [46].

The responsibility for the implementation of the WCAG is more widely shared, compared to the other WAI guidelines, given that its primary concern is Web content and that many Web users publish content. The latest version (i.e., 2.1) [47] of the WCAG was published in June 2018 however, version 2.0 [48] widely remains the accepted standard internationally. For example, the International Organization for Standardization (ISO) has approved the WCAG 2.0 as a standard (i.e., ISO/IEC 40500:2012) [49]. The ISO has 164 member countries and its international standards are followed by a considerably larger number of organisations worldwide [50]. The European Union has also made WCAG 2.0 compliance a requirement

for all EU commission websites [51]. The WCAG is organised into 12 individual guidelines categorised into 4 principles: (1) operable—ensures that interface elements and navigation are easy and safe for use; (2) understandable—the interface and information displayed therein must be easy to interpret accurately; (3) perceivable—elements of the user interface and information displayed therein must sufficiently noticeable to users; (4) robust—provision of flexible content that can be reliably interpreted by a wide range of user agents, including assistive technologies [52]. The WCAG focused almost exclusively on those with hearing, visual and physical impairments up to version 2.0. The more recent 2.1 version introduced support for people with cognitive and learning disabilities [53]. Despite increasing the inclusivity of people with disabilities within the guideline, some work is still needed for WCAG to be more inclusive of persons with MDs.

Several Web accessibility research efforts have focused on people with MDs and produced helpful insight into ways accessibility could be improved for this group [54-56]. For example, Good and Sambhanthan [54] found that people with DA identified distracting design, confusing menus, poor navigation, time-limited forms, non-perceivable icons, slowly loading websites, poorly organised content, complicated language and excessive advertisements as major accessibility issues. Other research by Ferron, Rotondi and colleagues [55, 56] also offered guidance on how websites could accommodate people with severe MDs. They recommended that websites should explicitly state instructions for their use, provide a shallow page hierarchy, ensure labels are clear and obvious, and that websites should provide large navigational elements and menus that reduce clicking.

Given these findings and the guidance offered, it is clear that much of this research focused on barriers that relate to the neuro-cognitive deficits such as impaired attention, information processing, problem-solving and not socio-cognitive deficits such as impaired affect regulation and difficulties processing emotional information, which are all associated with MDs [54, 55]. Similarly, Web accessibility guidelines generally target performance while neglecting affective and emotional barriers.

There are some recent approaches using artificial intelligence (AI) and machine learning

(ML) that could also help accommodate people with MDs on the Web as well. These efforts are pioneered by leading Internet companies such as Facebook (including Whatsapp and Instagram) and Alphabet (Google's parent company), and are implemented globally across their widely adopted online products and services. Much of this work has not been formally documented in the public domain but some have been published in academic journals [57], articulated at conferences [58] and outlined in educational talks [59].

Facebook has recognised its unique position, given its networking features and aim of connecting friends, to help connect people expressing suicidal ideation with people who can support them. The social networking site has employed AI and ML to detect user-generated content (e.g., posts and streaming video) on the platform where someone might be expressing thoughts of suicide or actively carrying out suicide [57]. Similarly Jigsaw, a business incubator within Alphabet, along with Google, applies AI through building ML models that could understand the emotional impact of language. This technology called, *Perspective*, is able to help combat online abuse and harassment by predicting which comments are likely to be perceived as being *toxic* to a conversation or harmful to those engaged in a particular conversation [59]. Perspective helps ensure that the voices of vulnerable persons, which would otherwise be likely stifled or silenced by hostile conversations, are heard.

1.2 Project Rationale

Many important knowledge gaps remain unfilled given the lack of focus on MDs by Web accessibility initiatives. Consequently, Web professionals lack the information needed to provide suitable accommodations for people with these conditions when using the Web. An initial search of databases — including MEDLINE, PsycARTICLES, CINAHL, Library, Information Science and Technology Abstracts, Computers and Applied Sciences Complete, ACM Digital Library SpringerLink and OpenGrey — in 2015 for Web accessibility, MDs and related keywords returned only 3 directly applicable search results [54-56]. These studies did not consider or cover a wide range of websites (e.g., social networking, e-commerce, education, health) and consequently left many unanswered questions about common aspects of Web usage. Also, given their respective aims, these studies also did not employ methods

that would provide detailed insights into what barriers exist for people with MDs and how these barriers could be removed or reduced.

A comprehensive understanding of the Web access barriers people with MDs experience is critical for addressing accessibility for this group. It is expected that when Web accessibility standards, guidelines and measures are informed by evidence, that these tools are more likely to reliably articulate what barriers exist and to offer valid recommendations about how these barriers could be removed or reduced. The BETTER (weB accEssibiliTy for people wiTh mEntal disoRders) project, which forms this PhD project, was initiated to provide this evidence.

BETTER's main goal, as articulated in its methodological protocol [60], was to determine whether current Web accessibility measures must be adapted for people with DA and if so, in what ways. The project focused on DA because they are the most common MDs. BETTER relied on collaborations with relevant stakeholders such as people with DA, professionals in the field, policymakers and researchers. The project's initial methodological protocol [60] was adjusted due to time constraints and two studies were conducted to achieve the project's goal: (1) a systematic review; and (2) a study using interviews and an Web-based expert survey.

Article 1 [61] is a systematic review tasked with identifying the barriers people with MDs encounter when using the Web and the recommended facilitation measures to remove or reduce these barriers. Given the suspected dearth of research in the area, search terms for the review were broadly based on concepts relating to Web accessibility, mental health conditions and also digital technologies. A synthesis was performed by categorising data according to the 4 foundational principles of Web accessibility, as proposed by the W3C [42], which forms the necessary basis for anyone to gain adequate access to the Web. The 16 publications included in this review indicates that there is little research on the barriers people with MDs experience when using digital technology and the facilitation measures used to address such barriers. It is believed that this review was the first attempt to provide a full compilation of research and guidelines-based barriers and facilitation measures relevant to Web usage by people with

MDs. Findings were discussed in the context of research coverage of MDs and digital technologies, methodological quality, and research recency. The study generally concludes that there is a need for more rigorous research to be exhaustive and to have a larger impact on improving the Web for people with MDs. It further recommended urgent investigations into possible barriers related to sociocognitive deficits—impaired affect regulation and difficulty processing emotional cues.

Article 2 built on study 1 by pursuing a more robust and fuller understanding of the difficulties people with DA experience online. This study employed data triangulation using face-to-face semi-structured interviews with people with DA and a comparison group, and a persona-based expert Web-based survey with mental health practitioners. Findings show that people with DA also experience difficulties when using the Web that are related to the socio-cognitive deficits associated with their conditions. Findings also suggest that mental health practitioners have a good awareness of the difficulties that people with DA are likely to experience when using the Web. The discussion of findings focused on a contrast of the difficulties reported by people with DA, the control group and mental health practitioners for each emergent theme. The study calls for novel approaches using emerging technologies, such as artificial intelligence, to aid in the removal and reduction of the difficulties identified using more carefully personalised experiences.

1.3 Contributions of the BETTER Project to Public Health

BETTER contributes to the field of public health by promoting mental health through improved access to Web-based resources. The project has provided, to the best of my knowledge, the first systematic investigation into the Web accessibility barriers people with DA encounter, and into how these barriers could be addressed. These findings will help better-position people with DA, local communities, public and private organisations, and society at large to encourage the development of more accommodating Web-based resources that meet the Web accessibility needs of people with DA. This will also support compliance with article 9 of the Convention on the Rights of Persons with Disabilities as it relates to ensuring access, on an equal basis with others, to publicly available information and

communications technologies.

In addition to promoting informed choices, BETTER also recommends systematic efforts towards promoting mental health. BETTER's findings pinpoint areas in need of further research and provides a methodological protocol that can be adopted for further Web accessibility MD-specific research [60]. This insight and protocol is likely to foster more research with the aim of broadening our understanding of people with MDs' Web accessibility needs. Future research can build on knowledge from BETTER's findings and confidently expand accessibility investigations into other everyday digital technologies (e.g., mobile devices, wearables) and interfaces (e.g., voice, gesture). In addition to pursuing research into facilitation measures that reduce barriers for people with DA and other MDs, BETTER has highlighted the importance of developing measures that target members of this group at an individual level as well. Responding to this challenge will require adopting emerging technologies such as AI to provide personalised experiences for users affected by MDs. These future facilitation measures will also benefit from BETTER's protocol and be readily informed about what barriers are well suited for targeting.

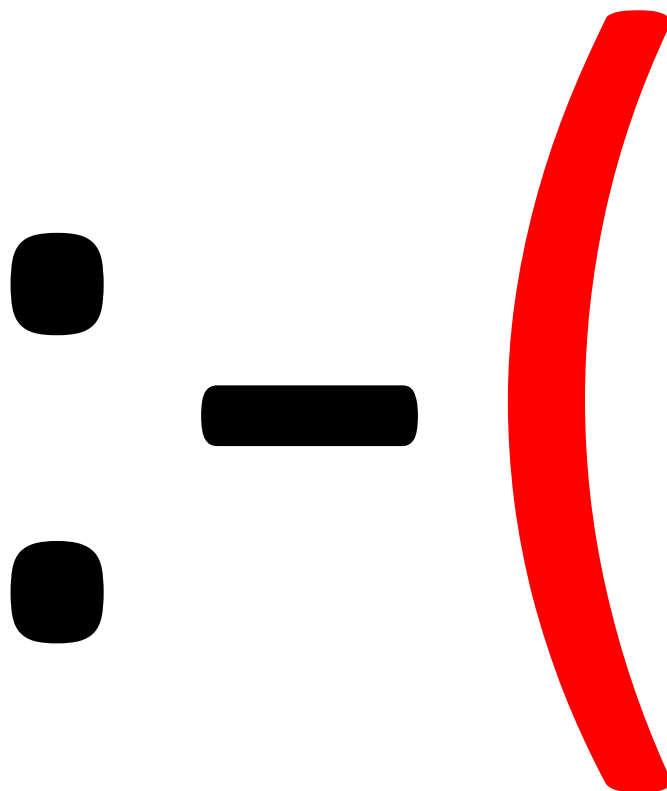
Web accessibility and other related standards, educational initiatives and policies can also be updated to adequately accommodate the needs of people with DA on the Web. BETTER has made contributions in each of these areas. BETTER, in collaboration with the Department of Computer Science at Oslo Metropolitan University, contributed to a report on the challenges of information and communications technology related to negative mood and feelings of anxiety (Appendix A). The report will be submitted to the International Telecommunications Union to inform the development of related international standards. The project also contributed to a W3C issue paper, currently in preparation, on the 'Challenges and Proposed Solutions for People with Mental Health Conditions'. BETTER was also invited by Helios Kliniken GmbH and Fjord GmbH to deliver educational talks to practitioners on designing safe digital tools for people with MDs. The project also made a significant contribution to a World Health Organisation policy response targeting governments on the issue of increasing Internet access for persons with disabilities (Appendix B).

As people increasingly turn to the Web as an resource for the management of their health, it is vital that people with MDs enjoy the same level of access to information and Web-based resources as everyone else. It is envisaged that any reduction in the Web accessibility barriers identified by BETTER will not only enhance the participation of people with DA in society but also everyone else who uses the Web to help live healthier and fuller lives.

1.4 Appendix

1.4.1 Appendix A - Towards Universal Access: ICT Challenges Related to Mood and Feelings of Anxiety

Towards universal access:
ICT challenges related to mood and feelings
of anxiety



1 Summary

Everyone should be able to use ICTs regardless of their mood or feelings of anxiety. However, some features of ICTs can potentially produce barriers to use for persons experiencing a disturbance in mood or anxiety and put them at a disadvantage. Therefore, there is an urgent need to consider how to better accommodate persons experiencing a disturbance in mood or anxiety in the design of ICTs. This brief outlines possible paths towards achieving this goal through the efforts of stakeholders.

1.1 Keywords

Accessibility; universal access; mental disorders; policy brief; disability; mood; depression; anxiety; information and communications technology

1.2 Change Log

None

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2 Definitions

Information communications technology:

Mental disorders: Term used to imply the existence of a clinically recognisable set of symptoms or behaviours associated in most cases with distress and with interference with personal functions

Mood disturbance: A condition marked by unpleasant changes in mood. If mild and occasional, the feelings may be normal. If more severe, they may be a sign of a major depressive disorder.

Persona: Reliable and realistic representations of key user segments for reference.

3 Abbreviations

ICT: Information and communication technology

4 Introduction

Everyone should be able to use information communications technology (ICT) regardless of their mood or feelings of anxiety. ICTs are a necessary means of gathering timely information to support everyday tasks such as ensuring productivity at work, making smart purchases and choosing convenient travel options. These technologies also provide useful ways to maintain relationships with others and offer many opportunities to engage in recreational activities including online shopping, gaming, watching movies and listening to music. Understandably, Article 9 of the United Nations' Convention on the Rights of Persons with Disabilities calls for equal access to ICT products and services intended for public use.

However, some features of ICTs can potentially produce barriers to use for persons experiencing a disturbance in mood or anxiety and put them at a disadvantage. Using ICTs can be a very cognitively demanding activity requiring the ability to quickly analyse, synthesise, evaluate and apply information. From booking an emergency flight at short notice to visit a severely ill relative to making a large last-minute financial transaction that could result in penalties if past due, online interactions can be especially difficult, even when not accounting for the distraction of adverts or perils of online fraud. Also, the usual lack of non-verbal and social-context cues (e.g., facial expressions) in ICTs provides little guidance for behaviour and can make interaction difficult for those persons having any of these experiences.

Therefore, there is an urgent need to consider how to better accommodate persons experiencing a disturbance in mood or anxiety in the design of ICTs. As the age of automation and artificial intelligence increasingly advances, human-to-human interaction is replaced and mediated with ICTs which poses many everyday challenges for persons with mood disturbances and those experiencing anxiety. The focus can no longer be solely on increasing the efficiency of ICTs but must also be on improving accommodations for this group early on and throughout the ICT development process. Developing appropriate technical standards and guidelines that support persons having any of these experiences would be an important step towards improving ICT accessibility for all.

This brief outlines possible paths towards achieving this goal. It uses examples based on the experiences of people in this group to articulate the challenges they face when using ICTs. It discusses the great opportunity ICTs provide for persons experiencing mood disturbances or anxiety and the wider society.

Finally, it offers guidance on steps that could be taken by policymakers, technical experts and advocacy groups to ensure ICT accessibility for all people.

5 Understanding the challenges

Moods and the experience of anxiety constantly change and are essential to how people experience the world. Moods and feelings of anxiety give people the ability to accurately judge others and situations, to be alerted to threats, and, on the flip side, to recognise opportunities. A disturbance in mood and the experience of anxiety can be acute when people experience overwhelming grief, sadness, anxiety or stress. Mood disturbances and anxiety can also be long lasting as is the case with those affected by mental health conditions such as depression and anxiety disorders. These disturbances and feelings of anxiety are typically triggered by upsetting life experiences ranging from a lack of sleep, minor illness or exposure to distressing material to job loss, a spontaneous public-speaking situation, or the death of a loved one. Regardless of where someone is positioned along this continuum, their use of ICTs in everyday life is often essential.

Findings from two recent studies [1, 2] have described this complex interaction between persons experiencing mood disturbances and anxiety, and ICTs in detail. First, a systematic review of studies that have considered the difficulties persons with mental disorders experience when using ICTs. Second, an in-depth interview study involving persons with depression (i.e., mood disturbance) and anxiety conditions, which also surveyed therapists who treat these conditions. These studies suggest that persons experiencing mood disturbances and anxiety encounter a wide range of barriers when using ICTs that make it difficult for them to perceive, understand and operate these technologies. These findings are also relevant for those who experience more acute forms of these conditions in everyday life.

5.1 Lack of control over exposure to content

The in-depth interview and survey study [2] shows that a lack of meaningful control over websites made using the Web challenging for persons experiencing either depression, anxiety or both. Control is specifically needed to limit access to websites and features and to reduce exposure to inappropriate content.

This research pinpointed recreational activities on the Web that made it difficult for people in this group to focus on completing important tasks as they engaged in these recreational activities instead. These activities include gaming, video streaming, shopping, using social media, reading news and researching general facts. Several people in this study mentioned being unable to stop engaging in these activities even when they wanted to stop. These activities were either described as addictive or an outlet for coping with unpleasant feelings and procrastination. Website features like '1-click' purchases, facilities for increasing banking overdrafts, automatic renewals of subscription services and similar-content information filters were identified as being too easy to use without giving due consideration. This ease of use was also attributed to making unintended purchasing, banking and time-management decisions.

Inappropriate content was considered as either offensive or personally sensitive content. Offensive content was described as being intrusive, irrelevant and inappropriate. It often appeared in the form of search results, adverts, social media posts, comments and news stories. Exposure to sensitive content resulted in involuntarily recollecting memories or personally meaningful issues that was upsetting for a temporary or prolonged period of time. Sensitive content on the Web is varied and diverse. For example,

experiences of receiving birthday notifications for close relatives who were deceased, seeing personalised adverts for medication one researched earlier and reading about friends' successes in life where one has failed (e.g., pregnancy, education, career). Some types of sensitive content are also composed to deliberately provoke a strong negative emotional response. For example, graphic content used in news stories and promoted posts on social media related to appeals by causes supporting people and animals in need.

5.2 Challenging user interfaces

The study [2] shared accounts from participants who expressed their frustration using websites that were complicated, limiting and malfunctioning. Unintuitive websites were overwhelming for many of the participants who often had to take breaks or frustratingly struggle until they were able to complete their task using the site. Examples of these frustrations include using shopping sites with too many purchase options, websites that require much time to understand, differentiating between adverts and content, and receiving unclear feedback about user actions. Malfunctioning websites lead to much concern and frustration amongst participants. Critical website features delaying the completion of important tasks, unnecessary notifications, persistent adverts that are irrelevant, adverts that block content, presented options that are unavailable, webpages not optimised for mobile browsing or poor connectivity. Malfunctioning features sometimes led to thinking about irrational worst-case outcomes. Non-responsive websites were also found to be particularly challenging due to the large amount of effort and frustration associated with completing a task when using these websites.

5.3 Lack of adequate support for struggling users

Participants in these studies were sometimes not given the necessary support by websites, especially when they were unwell. Messaging friends and sharing posts via social media websites is beneficial for obtaining support, but some users need encouragement to seek necessary help this way. Obvious mistakes are sometimes made when a user loses focus and participants in this study shared that websites often compound the situation by not correcting such errors.

5.4 Unsafe spaces

The issue of ensuring privacy and avoiding abuse was paramount for many participants in this research and crucial to their sense of feeling safe when using the Web. Some participants discussed how they grappled with complex issues relating to the differences in privacy approaches among countries and companies, and the repercussions for how much personal information they share on websites. Other participants were concerned about keeping their children safe but admitted they were unable to remain motivated to keep abreast of the constant changes in how safety is managed and circumvented on various websites. Several participants expressed an interest in realising the wider benefits of the Web. However, these participants are forced to strictly limit their use of many websites, like social media websites, and others narrow their use of the Web to a limited number of websites in fear of abuse and receiving unsolicited contact. The fear of being a victim of crime and getting involved in a conflict on the Web is equally as concerning as avoiding abuse and unsolicited contact. The result of dealing with this fear is often limiting Web use as well.

5.5 Lack of a systematic response

The body of research into the mentioned challenges is in need of significant development. As detailed by the first study [1] the challenges identified by these groups were not well stated and gave no

indication of the level of restriction they cause and the frequency of occurrence among a particular user group. The resulting absence of deeper insight into what the challenges are has weakened the response by those who have assumed responsibility to address them.

Recommendations to reduce and remove Web accessibility challenges are mainly based on the opinion of researchers conducting studies and consensus among members of international working groups of experts in the area of accessibility. This approach does not involve empirical research with clinically diagnosed samples to obtain conclusive evidence about what challenges exist and how they can be removed. Therefore, many existing recommendations were proposed without validation and in a way that makes future validation difficult. This poses much difficulty when selecting recommendations to address a particular challenge and attempting to increase the effectiveness of a specific recommendation.

6 The ICT opportunity for persons experiencing mood disturbances and anxiety

Persons experiencing mood disturbances and anxiety are poised to gain additional benefit from ICTs compared to others. They use ICTs as an informational resource to learn more about their conditions and to access help when necessary. They are also increasingly using ICTs as tools for convenient monitoring and treatment of their conditions. Additionally, there are many ICT services, which enlist friends, family and others affected by these conditions, such as forums, mental health communities and social networks, that are useful platforms of support.

7 Towards universal access

Ensuring adequate access to ICTs by persons experiencing mood disturbances and anxiety is possible. The four challenges discussed in clause 5 of this brief provides actionable insight from which policy makers, technical experts, regulators and advocates can act. It is understood that their efforts are dependent on available resources, which might be scarce, so a realistic framework that focuses on progressive instead of radical and immediate action is proposed.

All phases of design and implementation of ICT products and services should be examined against the four challenges discussed in clause 5. This can first involve the development of more realistic personas that are used to guide the design and implementation of ICTs. Personas must also reflect the unpleasant experiences of life, such as feelings of sadness, fear and stress, as these are fundamentally human characteristics as well. ICTs should then be examined at all points of interaction with people giving special attention to the aforementioned challenges. Content should be grounded in the correct context and the chosen media formats (e.g., text, images, audio, video) should be carefully considered as well. The idiom, “a picture is worth a thousand words” rings true here. A video about the abuse of animals may be distressing for some people but reading about it could be a safer and more acceptable option given that text conveys less social information than a video. Therefore, the provision of multiple media format options when presenting potentially emotionally-charged information could be helpful.

Strategies devised by these key stakeholders should also incorporate several key elements. Allowing users to customise their Web experience by giving them more control over access to websites and features, and over exposure to content. Avoidance of complication and technical errors. Provision of tools that will support users when they encounter these unique ICT challenges, for example pre-

selectable filters and profiles, and the use of artificial intelligence. Special effort to build trust in the Web by discouraging abuse and increasing the visibility of trust signals.

8 Conclusions

Persons experiencing mood disturbances and encounter barriers on the Web. These barriers are centred around exposure to inappropriate content, challenging user interfaces, lack of adequate support, and an inability to avoid unsafe spaces on the Web. Removing or reducing these barriers to access by this group is indeed possible. Adopting a realistic approach that focuses on strategic and progressive steps could be helpful.

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1.4.2 Appendix B - Access to the Internet for Persons with Disabilities and Specific Needs

Access to the Internet for Persons with Disabilities and Specific Needs



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Background

“The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect,” said the inventor of the World Wide Web, Tim Berners-Lee [1]. The increasingly large number of people worldwide who have access use and contribute to this vast resource to the benefit of everyone. From education and freedom of expression to leisure and commerce, the Web continues play an important role in everyday life.

Member states that have ratified the Convention on the Rights of Persons with Disabilities (CRPD) are committed, according to Article 9, to uphold access to communications technology such as the Web as a fundamental right [2]. This ensures that those with disabilities are not disadvantaged by a lack of reasonable access to the Web and its benefits comparable to others without a disability. Therefore, the Web is expected to accommodate everyone despite the considerable diversity in experiences and resulting needs.

The World Wide Web Consortium (W3C) through its Web Accessibility Initiative (WAI) works to ensure the right to have access to information and communications technologies is preserved for people with disabilities on the Web [3]. The WAI has produced several international standards designed to improve the accessibility of content on the Web and applications involved in its design and use.

The Web Content Accessibility Guidelines (WCAG) 2.0 is one of the WAI’s most successful standards. It has gained approval from the International Organization for Standardization (ISO) (i.e., ISO/IEC 40500:2012) [4], which has a membership of standard organisations based in over 162 countries [5]. Additionally, many countries have seen merit in instituting WCAG 2.0 compliance as a requirement for government and in some cases (e.g., Australia) non-governmental websites as well [6, 7].

However, despite all efforts some challenges and gaps remain for governments and other major stakeholders to address to advance the implementation of Article 9 of the CRPD for the Web.

Challenges facing persons with disabilities and specific needs on the Web

Lack of Web skills and informed use

Facilitating access to the Web is not limited to providing the necessary technological infrastructure. It is also ensuring no access barriers exist that makes it difficult to perceive, understand, navigate, and competently interact with Websites. Lack of Web skills, informed use, and accommodation on the Web are major hindrances to achieving this goal.

There are some indications that persons with disabilities may not be equally benefiting from some of the most lucrative opportunities made available on the Web as others do. Research has revealed that they use the Web in less personally beneficial ways when compared to others without disabilities [8]. Persons with disabilities in this study typically engaged in gaming and information seeking relating to health and government services. They were less likely to engage in social interaction, shopping, reading news, banking and job searching on the Web.

Some Web accessibility professionals are also concerned about the awareness level surrounding the use of adaptive strategies to address encountered barriers [9, 10]. For example, they believe that users are often not informed about Web browser accessibility preferences (e.g., adjust font sizes and page zoom) and other accessibility solutions, and how to use them.

Lack of accommodation on the Web

Over the last 18 years Web accessibility has concentrated on people with sensory and mobility disabilities, and on the major barriers faced by this population. Work on accessibility for persons with visual impairment aims to provide information via alternative sensory channels: auditory (e.g., screen readers); tactile means (e.g., refreshable Braille displays); sight (e.g., virtual retinal displays, customised pre-compensation of images to match the visual characteristics of individual users and produce undistorted retinal images) [11]. Alternative input mechanisms were developed for those with physical disabilities to access systems used to navigate the Web [12]. These include many special keyboards and novel pointing-based input methods operated by eye gaze tracking and other body parts (i.e., tongue, feet, elbows and head), and speech input devices. Guidelines have been good at integrating this knowledge and accommodating assistive technologies.

However, there is still considerable room for the improvement of access to assistive technologies, a wider range of websites and mobile. Purchasing assistive technologies represent an additional cost

to access the Web that erects an even larger barrier to Web access by these individuals who already tend to have less wherewithal than those without disabilities [13]. A 2016 study revealed that even when they gain access, blind users for instance, encounter great difficulty with taking and posting images and interpreting poorly described photos on social networking sites [14]. Much attention has not been directed at such sites despite their popularity.

Mobile access for persons with disabilities raises many currently unanswered questions as well. Mobile devices provide essential benefits for people with disabilities, especially relating to real-time informed-decision making. Search data underscores its importance as it suggests that a much greater number of users access the Web from mobile devices compared to alternative avenues for several countries around the globe [15]. Current work has seen the publication of an editor's draft document from the WAI on how its guidelines apply to mobile [16]. However, much research is needed to resolve the uncertainty surrounding the tolerance of mobile platforms to provide traditional support for accessibility features and how to effectively exploit this new interaction paradigm presented by these devices [17].

There is a dearth of Web accessibility work targeting persons whose experience of disability is not as apparent as the aforementioned — persons affected by mental disorders, sleep disorders and chronic fatigue syndrome — despite research showing a dire need. A keyword search of several relevant research databases revealed that some accessibility related research has been conducted for persons with sensory (156) and physical (64) disabilities. However, very little research has been conducted for those with less apparent disabilities (i.e., mental disorders and other cognitive impairments) (44) during the last five years.

Researchers have reported several website elements that persons affected by conditions that are associated with cognitive impairment such as depression and anxiety identified as being accessibility issues [18]. These include distracting design, confusing menu options, time limited response forms, information overload, poor content organisation, complicated language, excessive advertisements, and complex purchasing processes. Moreover, there are difficulties that this group experience offline that may be present on the Web as well but have not been researched in this context as yet. For example, it is sometimes difficult for people with depression to accurately interpret information exchanged during social interaction [19].

Promising approaches and good practice

WAI guidance

WAI relies on broad voluntary and non-structured community involvement to highlight difficulties that people with disabilities might experience when using the Web [3]. The process is often open to the public and employs research and stakeholder expertise. Volunteers are predominantly Web accessibility and development professionals followed by persons with disabilities. WAI aims for consensus among volunteers involved concerning the final inventory of barriers and corresponding recommendations to remove or reduce them. Some recommendations may appear more applicable to specific groups than others but the guidelines generally aim to ensure accessibility for all.

However, there are difficulties associated with a high rate of non-compliance to guidelines and evaluating compliance that are a major concern. For example, a 2015 study investigating WCAG 2.0 compliance found that 30.6% (15/49) of government websites of states in the United States of America (excluding Texas and Oregon) and the District of Columbia failed basic accessibility requirements (i.e., did not meet all WCAG 2.0 Priority 1 guidelines) [20]. Also, an earlier study found that though almost 70% of the 160 Australian websites in the study claimed at least WCAG 2.0 A compliance, only 2% of those actually met their claimed level of compliance [21]. Additionally, according to the WAI comprehensive and effective Web accessibility evaluations require human evaluators with expertise in a wide range of related areas [22]. A study involving a sample of such experts reported that they failed to reach the W3C recommended 80% level of agreement [23] for 50% of the 61 WCAG 2.0 success criteria when evaluating sites in the study [24]. Another study supports these findings revealing an average agreement among experts between 70 and 75%, with an error rate around 29% [25].

Other areas for improvement include participation by persons with disabilities and the linking of barriers with recommendations. More involvement from persons with a wider range of disabilities will ensure proper representation of everyone's interests during the guideline development process. Additionally, it is difficult to adopt new insight from research to increase the effectiveness of a particular recommendation, as guidelines are not explicitly linked to well-stated barriers and associated conditions. Though helpful information is given under the "Understanding Success Criterion" sections, there is no consistent information about the particular user categories affected, related disability types, hindered activities or tasks, level of restriction (inclusive of frequency) or supporting evidence. This is crucial information for the future validation and improvement of Web accessibility recommendations for a wide range of disabilities.

Research-based guidelines

There are several additional guidelines in existence that aim to improve accessibility, especially for older people. Many of these research-based guidelines are derived from observation studies of user evaluations and literature reviews of findings validated with participants who were Web users.

The research-based approach is relatively prompt, responsive and very helpful for providing evidence-based guidance about how to accommodate those with disabilities (i.e., generally or by specific group) who are not currently addressed by more established guidelines and standards. For instance, project entitled BETTER (weB accEssibiliTy for people wiTh mEntal disoRders) in collaboration with the World Health Organisation (WHO) has been investigating Web accessibility for depression and anxiety. It employs three-phases to examine this issue for people with these conditions: (1) identification of possible Web accessibility barriers using three data sources — a systematic review of literature, focus-group interviews with people affected by depression and or anxiety, and an expert survey using personas; (2) validation of Web accessibility facilitation measures for this population using experimental user-testing; (3) provision of recommendations for later validation using a delphi method.

However, a study a survey of 57 Web developers and accessibility advocates showed that except for the 'Beyond ALT Text: Usability for Disabled Users' guidelines (26%), at least 61% of participants had no knowledge of other guidelines included in the study. These guidelines include Making your Website senior-friendly-a-checklist (91%), Research Derived Web-Design guidelines for older people (87%), Research-based Web Design and Usability Guidelines (78%), Guidelines for Accessible and Usable Web Sites: Observing Users Who Work With Screen Readers (71%) and Web Usability for Senior Citizens (61%).

Filling the gaps

Research gaps

Researchers should closely coordinate their work with major initiatives within the accessibility community to increase their credibility and visibility within the community. They must also demonstrate how research-based recommendations could be coalesced with Web standards and implemented. These actions are very important for increasing the awareness and use of research-based guidelines.

Researchers should also pursue investigations into a wider coverage of disabilities in a more systematic way. Involving clearly defined and culturally diverse populations to obtain conclusive evidence about what barriers exist and how they can be removed or reduced will also be immensely helpful. Closer attention to contextual factors will also shed light on other important issues. For example, reasons why persons with disabilities are not taking advantage of the seemingly most valuable opportunities the Web provides to this group. These activities will entail ensuring each barrier is well-stated along with an indication of the level of restriction it causes and frequency of occurrence. This will help with informing the prioritisation of individual access issues for people with disabilities in guidelines. Strategies targeting the removal of barriers must also be validated before they are recommended as a solution.

Gaps in practice

An aggressive Web accessibility training program that not only focuses on established standards and guidelines but also on-going research insight must be pursued. It is also vital that persons with disabilities are involved throughout the development process to ensure that expended efforts on their behalf are effective. A renewed effort by the organisations to guarantee Web accessibility compliance to standards must be priority as this provides a good starting point.

Systematically involving persons with disabilities

Efforts must be made to develop capability within the community of persons with disabilities to effectively guide and ensure their best interests are being considered in Web accessibility research and practice. This must also involve an initiative to increase awareness of existing features designed for persons with disabilities to personalise Web-browsing. Bespoke training targeting persons with a specific category of disabilities and the tools available to them will also be useful. Developing tools for persons with disability to provide meaningful and transparent feedback about their needs when using the Web will also be instrumental for the improvement of Web accessibility.

The role of governments

Governments have the responsibility to facilitate access to the Web. It is understood that their execution of this role is dependent on available resources, which might be scarce, but more needs to be done. The notion of progressive realisation provides a realistic framework for governments with any level of resource availability to develop bespoke strategies that are progressive. It directs governments to assess their current state of affairs, devise meaningful and feasible steps, no matter

how small, towards the goal of making the Web accessible for all nature [26, 27]. Steps devised by governments should incorporate several key elements.

Strengthening links between key stakeholders

Governments should play a stronger role in unifying efforts by stakeholders — persons with disabilities, researchers and Web professionals — to ensure Web access to persons with disabilities. This will involve: identifying stakeholder needs and how to satisfy them; determining their interdependence; defining their individual contributions towards achieving success; offering transparent support (e.g., training, funding, monitoring and guidance) to each stakeholder. Fostering a good working relationship between stakeholders will be instrumental to this process.

Ensuring standards compliance

Governments must acknowledge the importance of Web accessibility by taking the lead. They should ensure that all government websites are standards compliant. Those in the private sector, especially those offering essential services, should be required to do the same. Support must be offered to those with less resources to implement this mandate. Monitoring mechanisms must also be established and firmer penalties for non-compliance should be issued as well.

Funding research to accommodate a wider range of disabilities

Adopting existing standards and guidelines is not sufficient to ensure Web access to all. Larger and more sustained research funding must be provided to investigate the needs of persons with a much wider range of disabilities on the Web and how to met them. This should be done in a manner that offers the same opportunities for all groups with disabilities. For example, funding areas neglected by research in the past should be considered as a matter of urgency.

Meeting the needs of persons with disabilities on the Web go beyond the provision of recommendations and adopting standards. Governments should take a bigger responsibility in enlisting the help of the private sector to participate in joint funding in support of mutually beneficial research. For instance, investigating how to institutionalise the underlying principles advocated by the CRPD within organisations will be crucial for a more effective and proactive response to ensuring access to the Web for persons with disabilities.

Empowering persons with disabilities

Policies should consider the high economic burden on persons with disabilities to obtain expensive accessible solutions in addition to standard equipment required to access the Web. Special measures must be taken to reduce the associated costs of accessing the Web for this group. For example, priority must be placed on sourcing and or developing accessible solutions that are more resistant to obsolescence due to rapid technological development, which characterises the Web and its access points.

Modules focusing on accessible solutions need to be integrated into digital literacy programs. These modules will provide a general overview of available solutions, their use and ways to obtain them. This training should also be included in existing online resources.

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2 Article 1 - Barriers and Facilitation Measures Related to People with Mental Disorders when Using the Web: A Systematic Review

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Barriers and Facilitation Measures Related to People With Mental Disorders When Using the Web: A Systematic Review

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Abstract

Background: Mental disorders (MDs) affect almost 1 in 4 adults at some point during their lifetime, and coupled with substance use disorders are the fifth leading cause of disability adjusted life years worldwide. People with these disorders often use the Web as an informational resource, platform for convenient self-directed treatment, and a means for many other kinds of support. However, some features of the Web can potentially erect barriers for this group that limit their access to these benefits, and there is a lack of research looking into this eventuality. Therefore, it is important to identify gaps in knowledge about “what” barriers exist and “how” they could be addressed so that this knowledge can inform Web professionals who aim to ensure the Web is inclusive to this population.

Objective: The objective of this study was to provide an overview of existing evidence regarding the barriers people with mental disorders experience when using the Web and the facilitation measures used to address such barriers.

Methods: This study involved a systematic review of studies that have considered the difficulties people with mental disorders experience when using digital technologies. Digital technologies were included because knowledge about any barriers here would likely be also applicable to the Web. A synthesis was performed by categorizing data according to the 4 foundational principles of Web accessibility as proposed by the World Wide Web Consortium, which forms the necessary basis for anyone to gain adequate access to the Web. Facilitation measures recommended by studies were later summarized into a set of minimal recommendations.

Results: A total of 16 publications were included in this review, comprising 13 studies and 3 international guidelines. Findings suggest that people with mental disorders experience barriers that limit how they perceive, understand, and operate websites. Identified facilitation measures target these barriers in addition to ensuring that Web content can be reliably interpreted by a wide range of user applications.

Conclusions: People with mental disorders encounter barriers on the Web, and attempts have been made to remove or reduce these barriers. As forewarned by experts in the area, only a few studies investigating this issue were found. More rigorous research is needed to be exhaustive and to have a larger impact on improving the Web for people with mental disorders.

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KEYWORDS

World Wide Web; mental disorders; systematic review; accessibility; interaction design; Web-based interaction

Introduction

Mental disorders (MDs) are a significant public health issue owing to their high impact on people with these disorders, in terms of restrictions placed on their participation in all areas of life, family life and the wider society. Mental disorders affect almost 1 in 4 adults at some point during their lifetime [1] and coupled with substance use disorders are the fifth leading cause of disability adjusted life years worldwide [2]. People with mental disorders (PwMD) often experience similar impairments, activity limitations, and restricted participation in life events, even with the diversity in symptoms and etiology associated with these conditions [3]. Family members often provide care, which sometimes puts a strain on familial relationships, reduces opportunities for leisure, and negatively impacts finances due to time spent providing care instead of working [4]. The associated reduction in productivity from both affected persons and their family can translate to a decrease in contributions to the local economy [5]. In addition, having a large segment of the population subscribing to treatment and support services incurs considerable costs [5].

The Web is often used as a source of support for PwMD and shows great promise for the reduction of the burden of mental disorders. Mental health–related Web browsing, primarily for information seeking, is common among PwMD [6,7]. Web-based mental health communities are known to supplement traditional mental health services [8] and act as an important factor in encouraging PwMD to seek professional help [9]. A recent meta-analysis has indicated that guided Web-based cognitive behavioral therapy may be as effective as the face-to-face equivalent for social anxiety disorder, panic disorder, spider phobia, and depressive symptoms [10]. Many other Web-based treatment and intervention options are increasingly being explored for other mental disorders (eg, posttraumatic stress disorder, eating disorders) [11] and populations including children (eg, Project CATCH-IT, MoodGYM) [12,13] with positive results.

There are also features of the Web environment that could potentially limit how much PwMD who experience cognitive deficits can benefit from the Web. Using the Web is considered a very cognitively demanding activity requiring not only good knowledge and understanding of Web features (eg, search engines) but also the ability to quickly analyze, synthesize, evaluate, and apply presented information while avoiding inconsequential details (eg, adverts and untrustworthy information) that are abundant on the Web [14]. Several cognitive domains, including executive functioning, attention, and memory, are commonly impaired in PwMD [15]. These impairments may be linked to difficulties using the Web such as when performing Web searches, task switching, retaining and recalling information, and ignoring distractions (eg, adverts) to focus attention. Moreover, the Web has also been found to be relatively absent of nonverbal and social context cues (eg, gestures, facial expression) compared with off-line [16,17]. These cues are important for guiding behavior when interacting with others, and their absence could make social interaction difficult. Although Web users are normally able to skillfully compensate and overcome these “deficiencies” [18], sometimes

even by capitalizing on them [19], it could be challenging for PwMD who experience cognitive deficits to do the same.

People with mental disorders have received little attention from Web accessibility research despite increased inquiries into the difficulty others with cognitive impairment face on the Web. This research gap was highlighted over a decade ago [20,21], and more recently, there has been some indication that the gap still exists [22]. Current recommendations also prescribe the same treatment to address accessibility for PwMD and a myriad of other diverse conditions that fall under the broad heading of conditions associated with cognitive limitations (eg, intellectual disabilities, multiple sclerosis) [23].

A comprehensive review of literature concerned with the barriers PwMD encounter when using the Web and/or the facilitation measures developed to address these barriers is needed to ensure that the Web is inclusive to this population. Available knowledge will support Web professionals in making well-informed choices about the removal of barriers affecting PwMD. If this is not possible, it may instead provide facilitation measures to accommodate this group. As a result, Web-based resources could be systematically evaluated for compliance with measures that are known to remove barriers or provide facilitation for PwMD. Identified gaps in knowledge about “what” barriers exist and “how” they could be addressed—based on a comparison and integration of what is known on the topic—is likely to encourage further research into these highlighted areas as well.

The objective of this systematic review was to provide an overview of the existing evidence regarding the barriers PwMD experience when using the Web and facilitation measures used to address such barriers. Specific aims are to detail barriers and facilitation measures, how they were identified or developed, and related trends (ie, the extent of coverage for specific mental disorders or digital technologies, study designs used, publication recency, and research region).

Methods

A systematic review was carried out to identify barriers PwMD encounter when using the Web and the recommended facilitation measures to remove or reduce these barriers.

Search Strategy

Search terms were broadly based on concepts relating to Web accessibility, mental disorders, and also digital technologies (see [Multimedia Appendix 1](#)). Digital technologies were included because knowledge about any barriers here would likely be also applicable to the Web. This was also a proactive measure to avoid having the review suffer from the paucity of research in the area as revealed by preliminary searches. Databases searched include MEDLINE, PsycARTICLES, CINAHL, Library, Information Science & Technology Abstracts, Computers & Applied Sciences Complete, Inspec, Web of Science Core Collection. Reference lists of included publications were also searched to avoid missing relevant publications not identified during the search of databases. There were no publication date restrictions to ensure that the review included as many studies as possible. There was also no restriction to

empirical studies. Other types of publications such as international standards and guidelines are usually widely adopted and highly regarded and can be especially helpful when there is insufficient empirical evidence on a particular issue.

Eligibility Criteria

Included publications describe the difficulties PwMD encounter when using any digital technology or provide guidance on how to improve the accessibility of any digital technology for this group. All mental disorders were considered regardless of a formal diagnosis or not. All digital technologies such as computers, video games, mobile devices, and websites were also considered. Journal articles, gray literature, international and national standards and guidelines, reports, and conference proceedings written in the English language were considered for inclusion. Publications in the form of commentaries, letters to the editors, and editorials were excluded.

Eligibility Assessment

One reviewer (RB) screened all abstracts, and another (DH) screened 84% (1692/2013) selected at random. Both screenings were conducted independently to reduce the chance of reviewer bias and increase reliability [24]. Inconsistencies in ratings—eligible, ambiguous, or excluded—were later discussed and resolved by consensus. One reviewer (RB) then appraised the full texts of abstracts rated as eligible.

Data Extraction and Synthesis of Results

Information extracted from studies was study characteristics—publication year, country, study design, methods and participants or target population (eg, mental disorders, age, gender, and education); barriers and facilitation measures—process used for the development of the facilitation measure and related mental disorders; and definitions of accessibility and disability. Data extracted from other documents—international standards and guidelines—did not include information about study designs and participants (eg, age and gender).

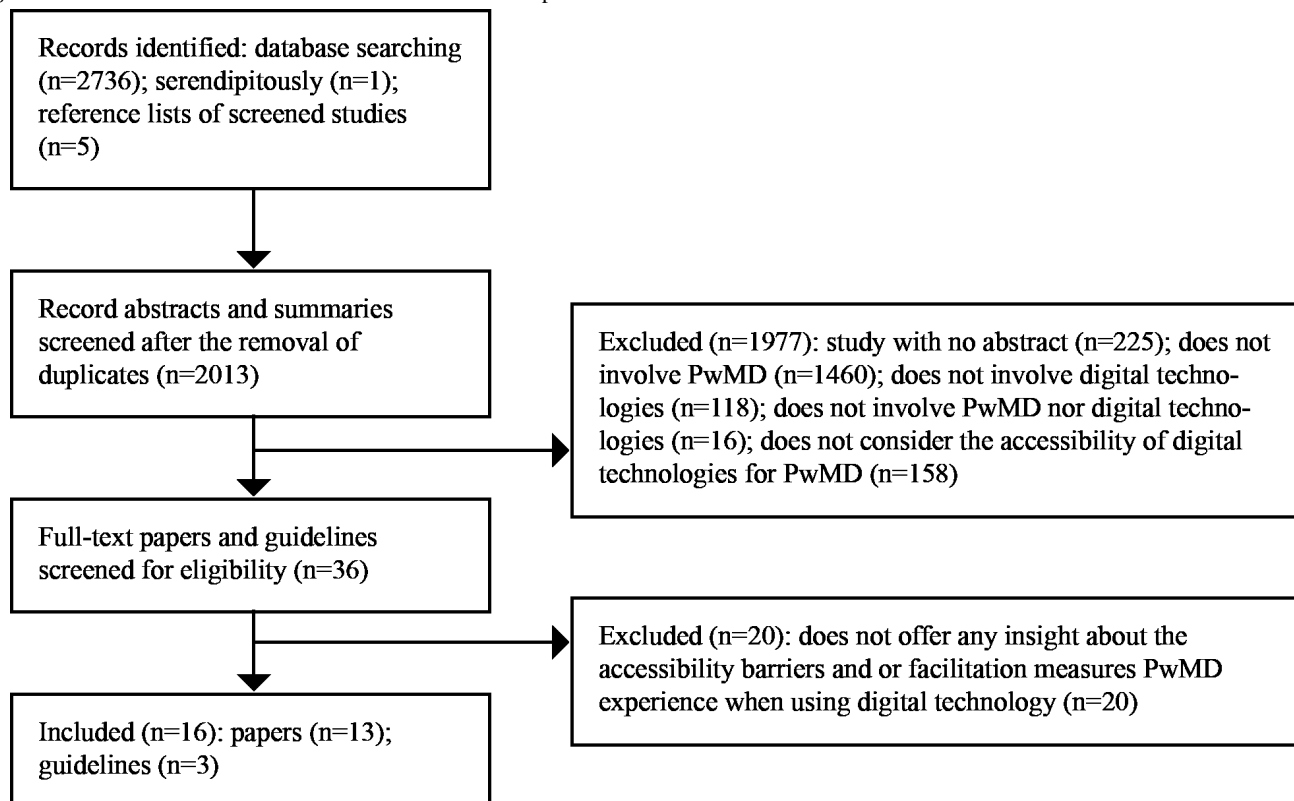
The International Classification of Functioning, Disability and Health was used to define barriers and facilitation measures

[25]. Factors (eg, small font, complicated language) that through their absence or presence limit functioning were identified as barriers. Conversely, factors (eg, legible font, simple language) that instead improve functioning through their absence or presence were identified as facilitation measures.

Synthesis was performed by categorizing all findings and later summarizing facilitation measures recommended by studies. Data were first categorized according to the 4 foundational principles of Web accessibility: operable—user interface components and navigation must be easy and safe to use; understandable—information and the operation of a user interface must be easily interpreted accurately; perceivable—information and user interface components must be presentable to users in ways they can be sufficiently aware on these components; robust—content must be flexible enough that a wide range of user agents, including technologies that enable persons with disabilities to perform tasks that would be otherwise challenging (ie, assistive technologies), can interpret it reliably [26]. These 4 foundational principles were proposed by the World Wide Web Consortium (W3C) and form the necessary basis for anyone to gain adequate access to the Web. Results from studies came from 2 sources—expert opinion or empirical research—and they are labeled to denote these different sources. Facilitation measures from guidelines are also labeled for easy identification. Facilitation measures recommended by studies were later summarized into a set of minimal recommendations after the categorization of findings. Those from guidelines have already been aptly summarized elsewhere [27-29].

Results

A total of 16 publications were included in this review, comprising 13 studies reporting on the usability of various technologies [30-40] and Internet or computer use among PwMD [41,42] and 3 international guidelines [23,43,44], which were all developed by the W3C. These guidelines have been adopted by many governments and are also widely considered as the international standard for Web accessibility. A flow chart of the review process is presented in [Figure 1](#).

Figure 1. Flowchart of the review identification and selection process.

Study and Guideline Characteristics

Nine of the included studies [30-33,35,37-39,42] originated in the United States, 2 studies [34,40] in the United Kingdom, one [41] in Austria, and another [36] in Sweden as summarized in Table 1. Over 62% (10/16) of the included publications [32-34,37,38,42] were published within the last 5 years, and the earliest [35] was published in 1998.

All 3 included guidelines were published by the W3C based in the United States. However, the guidelines are the result of collaboration among international experts. Two of the three included guidelines (User Agent Accessibility Guidelines 1.0 and Authoring Tool Accessibility Guidelines 1.0) were published over 12 years ago, and the third (Web Content Accessibility Guidelines 2.0) was published in 2008.

Table 1. Characteristics of included publications.

Citation, sample size (n), and year	Origin country	Study design	Digital technology	Diagnosis
[35], 52, 1998	United States	Qualitative, focus groups and interviews, clustering and summation	Multimedia application	Depression
[43], 2000	United States	Guideline	Web	Mental disorders
[31], 5, 2002	United States	Qualitative, focus group and usability testing, content analysis	Website	Anxiety disorder and depression
[44], 2002	United States	Guideline	Web	Mental disorders
[38], 98, 2007	United States	Quantitative, usability testing	Website	Bipolar disorder, schizophrenia, schizoaffective disorder, depression
[23], 2008	United States	Guideline	Web	Mental disorders
[41], 26, 2010	Austria	Qualitative, interviews, content analysis	Internet and website	Schizophrenia, schizoaffective disorder ^a
[32] (n=16), 2011	United States	Mixed, interviews, usability testing and expert review, thematic analysis, and descriptive statistics	Website	Schizophrenia, bipolar disorder, depression
[33], 71, 2011	United States	Qualitative, interviews and usability Testing, descriptive statistics, and <i>t</i> -tests	Website	Severe mental illness
[39], 149, 2012	United States	Quantitative (fractional factorial experimental design), usability testing, polychotomous logistic regression, and mixed-effect regression	Website	Substance use disorder, schizophrenia, depression, bipolar disorder, other psychotic disorder, schizoaffective disorder, anxiety disorder ^b
[42], 28, 2013	United States	Qualitative, interviews and observations, thematic and task analysis	Computer and website	Schizophrenia, bipolar disorder, depression, anxiety disorder, schizoaffective disorder
[37], 38, 2013	United States	Quantitative, usability testing, linear mixed-effect regression	Website	Schizophrenia, schizoaffective disorder ^b
[40], 12, 2013	United Kingdom	Qualitative, focus group, thematic analysis	Website	Bipolar disorder ^b
[30], 924, 2013	United States	Mixed, usability testing and survey, thematic analysis, descriptive statistics	Mobile phone and website	Schizophrenia, schizoaffective disorder
[34], 20, 2014	United Kingdom	Qualitative, focus group, thematic analysis	Website	Depression, anxiety disorder
[36], ≥100, 2015	Sweden	Qualitative, focus group, thematic analysis Digital technologies	Bipolar disorder, depression, schizophrenia, anxiety disorder, mental disorders	

^a Diagnosis was established using the International Classification of Diseases, 10th revision.

^b Diagnosis was established using the Diagnostic and Statistical Manual of Mental Disorders, 4th edition.

Design and Methods

Nine of the included studies investigated the usability of Web-based resources [30-34,37-40] and multimedia tools [35]. One study focused on Internet use [41], one on the use of digital technologies [36], one on the development of a mobile phone system [30], and another on computer use [42] among PwMD. Eight of the included studies used qualitative methods [31,33-36,40-42], 3 [37-39] adopted a quantitative approach,

and 2 [30,32] used mixed methods. Seven studies used usability testing [30-33,37-39], 5 used interviews [32,33,35,41,42], 5 used focus groups [32,33,35,41,42], and single studies used observations [42], survey [30], and user testing.

The 3 included guidelines [23,43,44] were primarily developed based on contributions over several years from experts involved in international working groups on varying aspects of Web accessibility [45].

Sample Characteristics

Sample sizes for included studies ranged from 5 to >100 (mean 48). Overall, 11 studies [30-33,36-42] reported the age of participants, which ranged from 18 to at least 75 years. Three studies [37,39,40] used the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM IV), 1 [41] used the International Classification of Diseases, 10th revision (ICD-10), and the remaining studies did not mention the use of a classification of mental disorders. Samples including people with schizophrenia (69%) [30,32,35-39,41,42] were most common among the 13 included studies, followed by samples where participants were affected by depression (62%) [31,32,34-36,38,39,42], schizoaffective disorder (46%) [30,37-39,41,42], anxiety disorders (38%) [31,34,36,39,42], and bipolar disorder (38%) [32,36,38,40,42]. Single studies reported that participants had severe mental illness (SMI) (eg, schizophrenia, schizoaffective disorder, bipolar disorder, and major depression) [33], mental disorders [36], psychotic disorders [39], and substance use disorder [39] but did not state any particular mental disorder. Most studies considered more than 1 mental disorder except [33], which focused on schizophrenia and [40] on bipolar disorder.

All 3 included guidelines were developed to give guidance on how to remove and reduce barriers experienced by people with a range of disabilities including auditory, cognitive, and neurological, physical, speech, and visual disabilities. Extracted guidelines were identified by the authors of the guidelines as being relevant to cognitive and neurological disorders [46]. These disorders include attention-deficit hyperactivity disorder, autism spectrum disorder, intellectual disabilities, learning disabilities, memory impairments, multiple sclerosis, perceptual disabilities, seizure disorders, and mental disorders. No particular mental disorder was specified.

Digital Technology

As summarized in Table 1, websites were the most studied digital technology, followed by single studies each investigating either computers [42] or multimedia applications [35]. Only three studies [42,30,36] investigated more than 1 technology, viz computers and websites, mobile phone and websites, and several digital technologies, respectively. The 3 included guidelines target websites (ie, Web Content Accessibility Guidelines 2.0), user agents (ie, any software that retrieves, renders, and facilitates end user interaction with Web content;

User Agent Accessibility Guidelines 1.0) and Web authoring tools (Authoring Tool Accessibility Guidelines 1.0).

Scope of Barriers and Facilitation Measures Related to Digital Technology Usage by PwMD

Included studies revealed 42 barriers and 59 facilitation measures. These are summarized in Tables 2 and 5. Four studies [31,32,35,37] did not mention any barriers and 2 [36,41] no facilitation measures. Four studies [30,33,34,38] recommended facilitation measures to address barriers, and only 25 of these pairings were identified.

The 3 included guidelines recommended 30 facilitation measures and did not explicitly report any barriers. However, the W3C has published several barriers on its website that people with cognitive and neurological disabilities including mental health disabilities face when using the Web. Examples of these barriers include complex navigation mechanisms, page layouts that are difficult to understand and use, and moving, blinking, or flickering content, and background audio that cannot be turned off [46].

Of the 131 identified barriers and facilitation measures, 63 were relevant to depression (48%), 54 to schizophrenia (41%), 48 to anxiety disorders (37%), 39 to bipolar disorder (30%), 37 to mental disorders (28%), 35 to schizoaffective disorder (27%), 11 to SMI (8%), and 3 to substance abuse and psychotic disorders equally (2%). Most of the 42 identified barriers were relevant to people with depression (64%), followed by those with an anxiety disorder (62%), schizophrenia (50%), bipolar disorder (40%), schizoaffective disorder (31%), mental disorders (17%), SMI (12%), and substance use disorder and other psychotic disorders equally (2%). Identified facilitation measures (n=89) mostly targeted people with depression (40%), schizophrenia (37%), mental disorders (34%), and anxiety, bipolar disorder and schizoaffective disorder equally (25%). SMI (7%) and substance use disorder and other psychotic disorders equally (2%) accounted for a small portion of the identified facilitation measures.

All barriers identified were revealed by research findings. Identified facilitation measures were proposed directly from research findings (n=31) [30,33,37-40], by international working groups of experts in the area of accessibility (n=30) [23,43,44] and expert opinion of researchers conducting studies (n=28) [31,32,34,35,42].

Table 2. Barriers and facilitation measures categorized by the ‘perceivable’ foundational principle of Web accessibility.

Barrier	Facilitation measure
Unable to locate information [34]	Provide intuitive navigation and ensure information filters and search functions work properly ^a .
Nonperceivable icons [34]	Avoid complicated language and ensure menu options and links are easy to understand ^a .
Too small font [30]	Increase font size ^b .
Difficulty reading small font and with eye strain [42]	Use small but legible font and refrain from using graphics in websites with shallow information hierarchies that do not feature navigational lists ^b [39]. Use large navigation buttons ^a [32]. Use a minimal number of colors that differentiates information and contrasts well ^a [31]. Use a simple design with pages that are pleasing to the eye and easy to read ^a [31]. Use graphics that are purposeful to the website ^a [31]. Prominently present hyperlinks: ensure clear labeling and highly visible positioning ^b [37]. Make hyperlinks' text as explicit as possible ^b [37]. List hyperlinks for a given topic together in a single column ^b [37]. Font size, buttons, and links should be sufficiently large to ensure usability ^a [42]. Use attention grabbing and not boring design ^b [40]. Guideline 1.1: Provide text alternatives for any nontext content so that it can be changed into other forms people need, such as large print, braille, speech, symbols, or simpler language ^c [23]. Guideline 1.2: Provide alternatives for time-based media ^c [23]. Guideline 1.3: Create content that can be presented in different ways (eg, simpler layout) without losing information or structure ^c [23]. Guideline 1.4: Make it easier for users to see and hear content including separating foreground from background ^c [23]. Guideline 5: Ensure that the user can control the behavior of viewports (ie, screen) and user interface controls, including those that may be manipulated by the author (eg, through scripts—list of computer commands) ^c [44]. Guideline 3: Support the creation of accessible content ^c [43]. Guideline 2: Generate standard markup (ie, document annotations) ^c [43]. Guideline 1: Support accessible authoring practices ^c [43]. Guideline 7: Ensure that the authoring tool is accessible to authors with disabilities ^c [43]. Guideline 2: Ensure that users have access to all content, notably conditional content that may have been provided to meet the requirements of the Web Content Accessibility Guidelines 1.0 ^c [44]. Guideline 3: Ensure that the user may turn off rendering of content (eg, audio, video, scripts) that may reduce accessibility by obscuring other content or disorienting the user ^c [44]. Guideline 4: Ensure that the user can select preferred styles (eg, colors, size of rendered text, and synthesized speech characteristics) from choices offered by the user agent. Allow the user to override author-specified and user agent default styles ^c [44]. Guideline 11: Allow users to configure the user agent so that frequently performed tasks are made convenient and allow users to save their preferences ^c [44].

^aFacilitation measure derived from expert opinion of researcher(s) conducting a study.^bFacilitation measure derived from empirical evidence.^cFacilitation measure derived from working group of experts.

Table 3. Barriers and facilitation measures categorized by the ‘understandable’ foundational principle of Web accessibility.

Barrier	Facilitation measure
Information overload [34]	Ensure information is organized well and avoids distracting design ^a .
Poor organization and presentation [34]	Ensure information is organized well and avoids distracting design ^a .
Excessive advertisements [34]	Ensure information is organized well and avoids distracting design ^a .
Confusing menu options [34]	Avoid complicated language and ensure menu options and links are easy to understand ^a .
Complicated language [34]	Avoid complicated language and ensure menu options and links are easy to understand ^a .
Complex purchasing process [34]	Avoid complicated language and ensure menu options and links are easy to understand ^a .
Distracting design [34]	Ensure information is organized well and avoids distracting design ^a .
Use of abstract reasoning [38]	Present text at a low reading level ^b .
Difficulty comprehending text [33]	Present text in large font and language below a fifth-grade reading level ^b .
Difficulty understanding abbreviations [30]	Remove abbreviations ^b .
Difficulty understanding long words [30]	Reduce text ^b .
Too lengthy text [30]	Simplify wording to fourth-grade level ^b .
Overabundance of information [41]	
Unwanted movements or flickering [36]	
Cluttered design [36]	
Lack of logic and consequence in concept and design [36]	<p>Provide resources in video and audio format^a [35].</p> <p>Use a modular and hierarchical approach when presenting information^a [35].</p> <p>Present important information first^a [35].</p> <p>Use large navigation buttons^a [32].</p> <p>Provide explicit labels that use longer concrete phrases to describe content^a [32].</p> <p>Explicit instructions on how to use the website^a [32].</p> <p>Provide text at fifth-grade reading level^a [32].</p> <p>Provide instructions on how to navigate programs and websites^a [42].</p> <p>Use a simple design with pages that are pleasing to the eye and easy to read^a [31].</p> <p>Provide category headings that clearly identify what information is underneath^a [31].</p> <p>Use menus with options that are ordered in a meaningful way and/or have an evident hierarchy^a [31].</p> <p>Give a clear identity to the homepage^a [31].</p> <p>Provide a homepage with just the right amount of information (graphics, text, links) to make the page understandable without overwhelming the user^a [31].</p> <p>Use language that the user can identify with^a [31].</p> <p>Meaningfully group of information^a [31].</p> <p>Use graphics that are purposeful to the website^a [31].</p> <p>Comprehensively list hyperlinks surrounding a given topic^b [37].</p> <p>Include minimal amount of content on pages^b [37].</p> <p>Single topic of interest: group hyperlinks and topics in one area of the screen^b [37].</p> <p>List hyperlinks for a given topic together in a single column^b [37].</p> <p>Use an ample number of images and visual aids^b [30].</p> <p>Provide content users can identify with (eg, case stories, worked examples, and success stories)^b [40].</p>

Barrier	Facilitation measure
	Use a flat hierarchy ^b [38].
	Provide explicit labeling ^b [38].
	Use lower-level modules (eg, code and data to implement a specific functionality) ^b [38].
	Use familiar phrasing ^b [38].
	Guideline 3.1: Make text content readable and understandable ^c [23].
	Guideline 3.2: Make Web pages appear and operate in predictable ways ^c [23].
	Guideline 3.3: Help users avoid and correct mistakes ^c [23].
	Guideline 7: Observe operating environment conventions for the user agent user interface, documentation, input configurations, and installation ^c [44].
	Guideline 12: Ensure that the user can learn about software features that benefit accessibility from the documentation. Ensure that the documentation is accessible ^c [44].
	Guideline 2: Ensure that users have access to all content, notably conditional content that may have been provided to meet the requirements of the Web Content Accessibility Guidelines 1.0 ^c [44].
	Guideline 3: Ensure that the user may turn off rendering of content (eg, audio, video, scripts) that may reduce accessibility by obscuring other content or disorienting the user ^c [44].
	Guideline 4: Ensure that the user can select preferred styles (eg, colors, the size of rendered text, and synthesized speech characteristics) from choices offered by the user agent. Allow the user to override author-specified and user agent default styles ^c [44].
	Guideline 5: Integrate accessibility solutions into the overall “look and feel” ^c [43].
	Guideline 6: Promote accessibility in help and documentation ^c [43].
	Guideline 4: Provide ways of checking and correcting inaccessible content ^c [43].
	Guideline 1: Support accessible authoring practices ^c [43].
	Guideline 7: Ensure that the authoring tool is accessible to authors with disabilities ^c [43].
	Guideline 3: Support the creation of accessible content ^c [43].
	Guideline 2: Generate standard markup ^c [43].

^aFacilitation measure derived from expert opinion of researcher(s) conducting a study.

^bFacilitation measure derived from empirical evidence.

Table 4. Barriers and facilitation measures categorized by the ‘operable’ foundational principle of Web accessibility.

Barrier	Facilitation measure
Poor navigation [34]	Provide intuitive navigation ^a .
Poor information filters [34]	Ensure filters and search functions work properly ^a .
Information overload [34]	Ensure information is organized well and avoid distracting design ^a .
Difficulty with fine motor coordination [33]	Change double clicking to single clicking ^c .
Difficulty clicking small radio buttons [33]	Change small buttons to large buttons ^b .
Difficulty using a mouse [33]	Create video mouse tutorial ^b .
Lack of knowledge on how to navigate a website [33]	Create basic instructions on how to change screens ^b .
Lack of knowledge on how to navigate a website [33]	Create a flat website (without multiple layers) ^b .
Too close and sensitive touchscreen buttons [30]	Enlarge buttons and space between them and require long enough touch-and-release functionality ^b .
Navigating a website with more than 5 hierarchical levels [39]	Use 99 words or less, 2 navigational areas or less, 7 hyperlinks or less, and few topic areas covered per page and no graphics and toolbars ^b .
Time-limited response forms [34]	
Slow response in websites loading information [34]	
Necessity to distance oneself from illness-related topics as part of the recovery process [41]	
Difficulty operating a computer mouse [42]	
Difficulty typing words in designated areas [42]	
Difficulty scrolling or using menu options to access information [42]	
Difficulty navigating [42]	
Processing delays [40]	
Broken links [40]	
Additional software requirements [40]	
Unwanted movements or flickering [36]	
Cluttered design [36]	
Evil design (when design is used to persuade or trick you to do something) [36]	
Functions and services with login [36]	
Lack of logic and consequence in concept and design [36]	
Lack of trustworthiness [36]	
Managing passwords and other codes (eg, Completely Automated Public Turing test to tell Computers and Humans Apart—CAPTCHA) [36]	<p>Use a website with no more than 3 hierarchical levels and words per hyperlink and that has navigational lists^b [39].</p> <p>Use small but legible font and refrain from using graphics in websites with shallow hierarchies that do not feature navigational lists^b [39].</p> <p>Use of different media and technological additions (eg, reward logo or bookmark functionality)^b [40].</p> <p>Ensure resource can be easily used by people with low computer literacy^b [40].</p> <p>Allow users to progress through the system at their own pace^a [35].</p> <p>Pop-up menus that appear with hovering to reduce need for clicking^a [32].</p> <p>Use a shallow hierarchy (reach the destination within 2 clicks)^a [32].</p>

Barrier	Facilitation measure
	<p>Use large navigation buttons^a [32].</p> <p>Provide several options (eg, mouse, keyboard arrows, touch screen) to assist users when navigating programs and websites^a [42].</p> <p>Provide instructions on how to navigate programs and websites^a [42].</p> <p>Use shorter pages that do not require a lot of scrolling, especially for the home page^a [31].</p> <p>Allow for personalization or getting the best fit^b [40].</p> <p>Guideline 2.2: Provide users enough time to read and use the content^c [23].</p> <p>Guideline 2.3: Do not design content in a way that is known to cause seizures^c [23].</p> <p>Guideline 2.4: Provide ways to help users navigate, find content, and determine where they are^c [23].</p> <p>Guideline 9: Provide access to content through a variety of navigation mechanisms, including sequential navigation, direct navigation, searches, and structured navigation^c [44].</p> <p>Guideline 10: Provide information that will help the user understand browsing context^c [44].</p> <p>Guideline 1: Ensure that the user can interact with the user agent (and the content it renders) through different input and output devices^c [44].</p> <p>Guideline 5: Ensure that the user can control the behavior of viewports and user interface controls, including those that may be manipulated by the author (eg, through scripts)^b [44].</p> <p>Guideline 2: Ensure that users have access to all content, notably conditional content that may have been provided to meet the requirements of the Web Content Accessibility Guidelines 1.0^b [44].</p> <p>Guideline 3: Ensure that the user may turn off rendering of content (eg, audio, video, scripts) that may reduce accessibility by obscuring other content or disorienting the user^c [44].</p> <p>Guideline 4: Ensure that the user can select preferred styles (eg, colors, the size of rendered text, and synthesized speech characteristics) from choices offered by the user agent. Allow the user to override author-specified and user agent default styles^c [44].</p> <p>Guideline 7: Ensure that the authoring tool is accessible to authors with disabilities^c [43].</p> <p>Guideline 1: Support accessible authoring practices^c [43].</p> <p>Guideline 3: Support the creation of accessible content^c [43].</p>

^aFacilitation measure derived from expert opinion of researcher(s) conducting a study.

^bFacilitation measure derived from empirical evidence.

^cFacilitation measure derived from working group of experts.

Table 5. Barriers and facilitation measures categorized by the ‘robust’ foundational principle of Web accessibility.

Barrier	Facilitation measure
	Guideline 3: Support the creation of accessible content ^a [43].
	Guideline 2: Generate standard markup ^a [43].
	Guideline 4: Provide ways of checking and correcting inaccessible content ^a [43].
	Guideline 6: Implement interoperable interfaces to communicate with other software (eg, assistive technologies, the operating environment, and plug-ins) ^a [44].
	Guideline 8: Support the accessibility features of all implemented specifications. Implement W3C Recommendations when available and appropriate for a task ^a [44].
	Guideline 7: Observe operating environment conventions for the user agent user interface, documentation, input configurations, and installation ^a [44].
	Guideline 1: Ensure that the user can interact with the user agent (and the content it renders) through different input and output devices ^a [44].
	Guideline 4.1: Maximize compatibility with current and future user agents, including assistive technologies ^a [23].

^aFacilitation measure derived from working group of experts.

Synthesis of Results

Categorization of Results by Foundational Principles of Web Accessibility

The identified barriers and facilitation measures were categorized according to the foundational principles of Web accessibility that was proposed by the W3C and are summarized in Tables 2 and 5 —additional tables organized by categories can be requested. Each identified barrier and facilitation measure was sorted into multiple categories if applicable. The barriers resulted in 3 categories as none were assigned to the robust category: operable (n=26); understandable (n=16); perceivable (n=4). The facilitation measures resulted into 4 categories: operable (n=35); understandable (n=49); perceivable (n=26); and robust (n=8).

Some studies paired a barrier with a corresponding facilitation measure, and other studies did not. The former was categorized based on the barrier, and the latter was categorized based on the specific barrier or facilitation measure that was not paired. Linking barriers that were not paired with a corresponding facilitation measure was beyond the scope of this review. A synthesis of Tables 2 and 5 is presented in the following section.

Operable

Identified barriers and facilitation measures (n=61) in this category gave most coverage to depression (49%), followed by bipolar disorder (43%), anxiety (41%), schizophrenia (39%), mental disorders (34%), schizoaffective disorder (20%), SMI (16%), and substance use disorder and other psychotic disorders equally (7%).

Barriers reported by included studies are primarily related to poorly designed navigational elements (eg, content filters), difficulties with fine motor coordination (eg, clicking small radio buttons, operating computer mouse, scrolling), poorly designed pages with time-limited response forms, too much information, and unoptimized components that contribute to slow webpage loading times.

Facilitation measures derived from empirical evidence gave guidance on design involving a reduction in the number of clicks needed to select options, an increase in buttons sizes, and websites that feature a shallow hierarchical structure and allows for personalization. Facilitation measures based on the expert opinion of researchers conducting studies suggest that websites should incorporate efficient content filters with intuitive navigation and permit users to browse at their pace.

Most facilitation measures recommended by the 3 included guidelines were focused on increasing users’ control. This involved providing users with enough time, alternative methods and information presentation styles, and instruction to interact with content. Other measures recommended that authoring tools must be accessible, promote accessible practices, and support the creation of accessible content.

Understandable

Most of the 64 identified barriers and facilitation measures in this category addressed depression (61%), schizophrenia (45%), anxiety (41%), mental disorders (34%), schizoaffective disorder (31%), and bipolar disorder (27%). However, SMI (3%) received considerably less coverage, and no barriers and facilitation measures were recorded for substance use disorder and other psychotic disorders in this category.

Included studies revealed barriers that included the use of complicated and excessive content, distracting and confusing design, and complex and overindulgent website functions (eg, excessive advertising and complicated purchasing processes). Facilitation measures derived from empirical evidence heavily focus on increasing the clarity of website content by ensuring only necessary information is shared and provided at a low reading level with no abbreviations and unfamiliar phrasing. Facilitation measures based on expert opinion focus more on the presentation and organization of website content. For example, they recommend the usage of alternative information formats, explicit labels that use concrete sentences to describe content and instructions, organizing content by importance, and forming meaningful content groups.

Facilitation measures from the 3 included guidelines recommend ways to help make content readable and understandable by ensuring abbreviations are expanded, reading level is appropriate, and providing explanations for any jargon used among other things. It was also recommended that several features should be incorporated into Web authoring tools: accessibility solutions in the design, mechanisms to correct inaccessible content and those that support accessible authoring practices.

Perceivable

Most of the 30 identified barriers and facilitation measures in this category targeted people with mental disorders (40%), depression (33%), anxiety and schizophrenia equally (30%), schizoaffective disorder (27%), bipolar disorder (17%) substance use disorder, and other psychotic disorders (3%). No barriers and facilitation measures were recorded for SMI in this category.

Identified barriers point to difficulties with reading small font, recognizing icons, and locating information. Facilitation measures derived both from empirical evidence and the expert opinion of researchers conducting studies recommend that links and other navigational elements should be easily recognizable, and use of images must be purposeful.

Facilitation measures recommended by the 3 included guidelines were predominantly focused on providing alternative content

options and personal configurations for content. Other measures, all originating from the Authoring Tool Accessibility Guidelines1.0, generally recommend that authoring tools and practices must be accessible and support the creation of accessible content.

Robust

This category only contains facilitation measures from 1 of the 3 included guidelines, and no barriers were identified. All identified facilitation measures target PwMD. Recommended facilitation measures largely promote compatibility between user agents, authoring tools and Web content, and assistive technologies. The suggested methods to do this involve providing ways of checking and correcting inaccessible content within authoring tools and mainly adhering to standard markup, relevant W3C recommendations, and operating environment conventions.

Summary of Facilitation Measures Recommended by Studies

Facilitation measures recommended by studies were summarized into a group of 20 from 59 recommendations and are summarized in Table 6. Table 6 does not list or arrange summarized facilitation measures in any particular order. Nine of the summarized facilitation measures were the result of empirical work and 11 from the expert opinion of researchers.

Table 6. Summary of facilitation measures recommended by studies.

Derived from empirical evidence	Derived from expert opinion of researcher(s)
Provide instructions on how to change between different page views.	Provide intuitive navigation and ensure information filters and search functions work.
Build websites with a minimal number of layers.	Provide explicit instructions on how to use the website.
Provide legible font and perceivable buttons and links.	Use simple and familiar language with no abbreviations.
Comprehensively list hyperlinks surrounding a given topic.	Allow users to progress through the system at their own pace.
Allow for personalization or getting the best fit for the user.	Use graphics and colors sparingly and meaningfully.
Use of different media and technological additions (eg, reward logo or bookmark functionality).	Provide several options (eg, mouse, keyboard arrows, touch screen) to assist users with navigation.
Use attention-grabbing and not boring design.	Provide resources in video and audio format.
Use simple and familiar language.	Use legible font and sufficiently large buttons
Use an ample number of images and visual aids.	Use a simple design with webpages that are pleasing to the eye and easy to read.
	Meaningfully group information.
	Use a minimal amount of content.

Discussion

Principal Findings and Comparison With Prior Work

The 13 studies that could be included in this review support preexisting views [20,21] that there is little research on the barriers PwMD experience when using digital technology and facilitation measures used to address such barriers. Despite being few, included studies and guidelines give valuable insight into what is known and where knowledge gaps lie.

Barriers People With Mental Disorders Encounter When Using Digital Technologies

People with mental disorders encounter a wide range of barriers when using the Web that makes it difficult for them to perceive, understand, and operate this tool along with content contained therein. Most barriers result from distracting and confusing design, complicated content and website functions, an overabundance of information, and a high-demand for good fine-motor skills and rapid information processing. Persons affected by other conditions associated with cognitive

dysfunction have also been known to experience many of these barriers as indicated by Web design guidelines [47].

However, included barriers were related to neurocognitive dysfunction—impaired attention, processing and responding to information slowly and problem-solving—and none were associated with sociocognitive deficits—impaired affect regulation and difficulty processing emotional cues. This is possibly due to affective measurements being overlooked by researchers of included studies.

Barriers were predominantly identified using qualitative research methods and to a lesser extent mixed and quantitative methods. Identified barriers were often not well stated—not including details about the particular user category affected, disability type, hindered activity or task, and how it is hindered—and there was no indication of how restrictive barriers were or how often particular groups of participants encountered them. This can contribute to the development of tentative and inconclusive recommendations that may not be helpful.

Recommended Facilitation Measures

Studies recommended facilitation measures that contribute towards ensuring the use of intuitive navigation, correctly functioning features, simple language, explicit, consistent and easy-to-detect website components, organized content, a flat hierarchical content structure, multimedia formats, and easy-to-operate functions. Facilitation measures recommended by included guidelines focused on improvement strategies that ensure websites are sufficiently operable, understandable, perceivable, and robust. Given the overlap in barriers, it was correctly anticipated that identified facilitation measures would also be mostly in agreement with recommendations for other conditions associated with cognitive deficits.

Facilitation measures were largely developed based on the opinion of researchers conducting studies and consensus among members of international working groups of experts in the area of accessibility. Some researchers [38] disagree with this approach because it does not involve empirical research with people affected by the particular condition when finding ways to meet their needs. However, facilitation measures derived from empirical work were similar to those based on the opinion of researchers conducting studies. Nonetheless, as shown in *Results* section, more focus was placed in different areas for 2 of the 3 principles under which facilitation measures were categorized. Facilitation measures recommended by included guidelines addressed problem areas, whereas other facilitation measures targeted specific barriers.

Facilitation measures were seldom linked to barriers. For example, no facilitation measures recommended by included guidelines had barriers associated with them. Consequently, many facilitation measures were recommended without validation and in a way that makes future validation difficult. This poses a challenge when selecting facilitation measures to address a particular barrier and attempting to increase the effectiveness of a particular facilitation measure.

Coverage of Mental Disorders

As schizophrenia is associated with more severe cognitive deficits than other conditions [48,49] and many participants were also recruited from institutional settings, it was foreseeable that most studies in the area would involve people affected by these 2 conditions. Good cognitive ability is very important when using the Web [38], and the deficits associated with these conditions can put this population at high risk of encountering barriers when using digital technologies such as the Web. Although people affected by depression, anxiety, and bipolar disorder are believed to experience less severe cognitive deficits than those affected by schizophrenia [15], these conditions received similar coverage by included studies. This is possibly due to these conditions being common and the debilitating impact they could still have on the lives of people affected.

Coverage of Digital Technologies

The overwhelming focus on websites out of many digital technologies demonstrates the heavy importance placed on the Web for its usefulness for PwMD. It also acknowledges that there is a need to further optimize Web-based resources. A single 1998 study [35] did not focus on websites but on a multimedia application. This is not surprising as the Web was not widely adopted during that time, but such applications were common.

Types and Suitability of Study Designs

Qualitative methods were suitably adopted for most included studies because they sought to describe and explore technology usage and design for PwMD. The 3 other studies [37-39] investigated the effectiveness of design elements for PwMD and appropriately used quantitative usability testing methods.

It is acknowledged that more granular analysis and reporting of results by mental disorders in studies that involved people with more than 1 MD could potentially reveal a slightly different result. All studies except 3 [37,39-41] noted the classification of MD used when recruiting participants, and this makes it challenging to perform comparisons between results of similar studies and mental disorders and to confidently link results to classifications.

Included studies raise concerns about a bias toward Western culture owing to an absence of research conducted with participants from other cultures. Multicountry studies (eg, [50,51]) have established that culture helps shape technology usage to a great extent.

Participants in included studies ranged widely in age from 18 to over 75 years, and the experiences between younger and older participants were rarely compared or separated. It is important to account for age because it plays a significant role in determining the types of barriers individuals experience when using technology [52,53].

Recency of Research

Findings show that more accessibility and usability research involving PwMD have been done in the last 5 years (10) compared with previous times (3). Considerably more research was done during the same period as revealed by a keyword search of several databases (ie, MEDLINE, PsycARTICLES,

CINAHL, Library, Information Science and Technology Abstracts, Computers and Applied Sciences Complete, and ACM Digital Library) for Web or information and communications technology or digital accessibility or usability and visual (139), mobility (64), cognitive and learning (34), and auditory (17) impairments. This suggests that activity in the area is increasing but not at a rate comparable to similar research done with other populations. Included accessibility guidelines were dated. However, version 2.0 updates for Authoring Tool Accessibility Guidelines and User Agent Accessibility Guidelines are almost stable and referenceable versions that will likely be W3C Recommendations and new Web standards [54,55].

Limitations

Although the literature search was conducted in many databases, results were limited to publications in English. However, no publications were later excluded based on this restriction. Included publications were not limited to those involving empirical work because preliminary searches indicated a paucity of research focusing on the area. As a result, international guidelines were included in the review. However, these guidelines are based on consensus among many experts and not empirical work, which allows for more valid conclusions. Moreover, although identified barriers found in studies were the result of empirical work, not all facilitation measures identified by studies were empirically validated. Nonetheless, as mentioned in *Discussion* section, empirically derived facilitation measures were similar to those based on the expert opinion of researchers conducting studies and were not in conflict with facilitation measures recommended by international guidelines.

Most of the included studies did not use a structured diagnostic classification (eg, ICD or DSM), and this has repercussions for our conclusions being tied to a diagnosis. For instance, it cannot be said unequivocally that persons with a particular diagnosis (eg, depression) experience a certain barrier as reported by those studies that did not use a structured diagnostic classification. Care was also taken to avoid making strong conclusions based on the small number of included studies (13), and it is advised that findings should be interpreted with this in mind.

Implications and Recommendations for Practice and Future Research

Web professionals can now consult a full compilation of research and guidelines-based barriers and facilitation measures

relevant to PwMD when developing and optimizing Web-based resources. This will raise awareness of PwMD's needs when using the Web among Web professionals and potentially stimulate further discussion and action within the profession.

The body of research is in need of significant development, and it is too early to make meaningful conclusions on any particular MD, especially based on high-risk symptomatology. For future research, priority should be given to investigating all mental disorders initially. More research in the area is therefore required especially for mood, anxiety, dissociative, somatic, eating, sleep, impulse control, and personality disorders as these have attracted little or no attention.

In agreement with [56-58], an increased effort is needed to investigate the accessibility of technological innovations and health systems. This should be done in a more systematic way with clinically diagnosed samples to obtain conclusive evidence about what barriers exist and how they can be removed. This would involve ensuring each barrier is well stated along with an indication of the level of restriction it causes and frequency of occurrence among the particular user group. Validating strategies targeting the removal of barriers before recommending them as facilitation measures would also be helpful.

Additional actions could be taken by researchers to further develop this area of work. Incorporating valid measures for sociocognitive impairment allows for a more comprehensive evaluation of accessibility for PwMD. It would be important to know if there are cultural differences in the barriers encountered, the level of restriction a particular barrier causes, and/or the frequency of its occurrence. Accessibility studies could also consider a wider range of websites—social networking, e-commerce, education, health—and not just websites targeting PwMD to ensure all aspects of Web usage are investigated.

Conclusions

Indeed, PwMD encounter barriers on the Web, and attempts have been made to remove or reduce these barriers. To the best of our knowledge, these results represent the first attempt to consolidate information on all barriers and facilitation measures investigated for PwMD when using digital technologies in a systematic way. However, it must be taken into consideration that only 13 studies and 3 guidelines meeting the inclusion criteria were identified. These findings also highlight the dire need for more rigorous research to be exhaustive and to have a larger impact on improving the Web for PwMD.

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Conflicts of Interest

None declared.

Multimedia Appendix 1

Summary of search concepts and terms.

[\[PDF File \(Adobe PDF File\), 45KB-Multimedia Appendix 1\]](#)**References**

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Abbreviations

MD: mental disorders
PwMD: people with mental disorders
SMI: severe mental illness
USA: United States of America
W3C: World Wide Web Consortium

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Multimedia Appendix 1. Search concepts and terms.

Concepts	Search Terms
Web Accessibility	accessibility, design for all, universal design, inclusive design, barrier free, accessible design, web accessibility, usability
Mental Disorders	mental disorder*, mental illness*, mental health, mentally ill person*, mental* ill*, schizophrenia, schizoaffective, psychosis, psychotic, depression, depressive, mania, manic, neurosis, anxiety, memory impairment, cognitive deficit, cognitive decline, cognitive impairment*, cognitive problem, cognitive disability, psychoneurosis, post-traumatic stress, posttraumatic stress, emotional trauma, bipolar, mood disorder, affective disorder, neurotic disorder, stress-related disorder, delusion, personality disorder, emotional disorder, emotional disability
Digital Technologies	computer systems, digital technology, computer, cyberspace, electronic, electronic mail, email, e-mail, internet, internet-based, net, online, web, web-based, world wide web, www, phone, telephone, smart phone, cell phone, mobile phone, cellular phone, mobile, short message service, sms, texting, smart device, text messaging, technology

3 Article 2 - Difficulties Encountered by People with Depression and Anxiety on the Web: Qualitative Study and Web-based Expert Survey

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Difficulties Encountered by People With Depression and Anxiety on the Web: Qualitative Study and Web-Based Expert Survey

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Abstract

Background: Depression and anxiety are the most common mental health conditions, and they were identified as leading contributors to global disability in 2016. People with these conditions rely on Web-based resources as a source of accurate health information, convenient and effective treatment, and essential social support. However, a recent systematic review revealed several potentially limiting difficulties that this group experiences online and also suggested that there is a partial understanding of these difficulties as only difficulties associated with neurocognitive, but not sociocognitive, deficits were identified. Therefore, this study fills this knowledge gap and contributes to a more robust and fuller understanding of the difficulties this group experiences online.

Objective: The objective of this study was to identify the difficulties people with depression and anxiety experience when using the Web and the Web activities that are most associated with the experience of difficulties.

Methods: The study employed data triangulation using face-to-face semistructured interviews with 21 participants affected by depression and anxiety and a comparison group (7 participants) without mental disorders (study 1) as well as a persona-based expert online survey with 21 mental health practitioners (MHPs) who treated people with depression and anxiety (study 2). Framework analysis for both studies proceeded through 5 stages: (1) familiarization, (2) identifying a thematic framework, (3) indexing, (4) charting, and (5) mapping and interpretation.

Results: In study 1, 167 difficulties were identified from the experiences of participants in the depression and anxiety group were discussed within the context of 81 Web activities, services, and features. From these, 4 themes and 12 subthemes describing the difficulties people with depression and anxiety experienced online were identified. Difficulties relating to the subtheme lack of control over access and usage were the most common difficulties experienced by participants in the depression and anxiety group (19/21). Sixteen difficulties identified from the experiences of participants in the comparison group were discussed within the context of 11 Web activities, services, and features. Most participants in the comparison group (6/7) contributed to the subtheme describing difficulties with unexpected and irrelevant content. In study 2, researchers identified 3 themes and 10 subthemes that described the perceived difficulties people with depression and anxiety might experience online as reported by MHPs. Practitioners linked these difficulties with 22 common impairments, limitations in activities of daily life, and diagnostic criteria associated with depression and anxiety.

Conclusions: People with depression and anxiety also experience difficulties when using the Web that are related to the sociocognitive deficits associated with their conditions. MHPs have a good awareness of the difficulties that people with depression and anxiety are likely to experience when using the Web. This investigation has contributed to a fuller understanding of these difficulties and provides innovative guidance on how to remove and reduce them for people with depression and anxiety when using the Web.

KEYWORDS

World Wide Web; depression; anxiety; accessibility; interview; persona; expert study; eHealth; usability; user experience; facilitators; barriers; mental disorders

Introduction

Background

Depression and anxiety are the most common mental health conditions, and they were identified as leading contributors to global disability in 2016 [1]. Among other resources, people with depression and anxiety often rely on the Web as a resource for health information gathering [2,3], a source of convenient and effective treatment across the life span [4,5], and as a means to connect with others and receive social support [6].

However, a recent systematic review revealed that people with mental health conditions experience difficulties when using the Web [7] that might limit how much they benefit from the Web and that are also poorly understood. The review highlighted a narrow range of difficulties solely related to neurocognitive dysfunction, that is, impaired attention, processing and responding to information slowly, and problem solving. Although sociocognitive deficits, that is, impaired affect regulation and difficulty processing emotional cues, are also as important features of mental health conditions as neurocognitive deficits [8,9], no difficulties relating to sociocognitive deficits were identified by the 13 included studies. The review suggests that despite a relatively recent surge of interest within the general field of human-computer interaction into sociocognitive phenomena [10], this trend seemingly does not apply to Web accessibility research focused on people with mental health conditions. For example, the included studies did not employ methods that would unearth possible difficulties related to sociocognitive deficits, and other researchers have arrived at similar conclusions [11].

Therefore, this investigation will provide a broader perspective that could fill the abovementioned knowledge gap and contribute to a more robust and fuller understanding of the difficulties people with depression and anxiety experience when using the Web. This knowledge will primarily assist Web professionals in creating more accommodating experiences for people with depression and anxiety online and allow this group better access to the opportunities available to everyone else using the Web. It is also expected that the Web would benefit from greater inclusivity where people with depression and anxiety could also make valuable contributions to this informational resource. This research was conducted under the BETTER (weB accEssibiliTy for people wiTh mEntal disORders) project that investigates Web accessibility for people with depression and anxiety and focuses on these conditions because of their high burden relative to that of other mental health conditions [12].

Objectives

The objective of this study was to identify the difficulties people with depression and anxiety experience when using the Web

and the Web activities for which the most difficulties are reported. This study specifically aimed to achieve its objective through triangulation [13] using 2 data sources: face-to-face interviews with people with depression and anxiety and a comparison group without mental disorders (study 1) as well as a persona-based expert Web-based survey with mental health practitioners (MHPs) who treated people with depression and anxiety (study 2).

Methods

Study Designs

Semistructured interviews with people with depression and anxiety and a comparison group were conducted in study 1, and an MHP expert online survey was conducted in study 2. Data triangulation [13] was used to add breadth and depth to the analysis and to evaluate the robustness of findings. Although useful for strengthening the study's conclusions and reducing the risk of false interpretations, triangulation was not used to reduce the findings to a single common truth or for validating one view with another view. Of all the stakeholders in the care of people with depression and anxiety, the person themselves and their therapists were the most accessible and well-suited sources of insight available to this investigation. Study 1 and 2 data were collected, aggregated, and later discussed.

Study 1—A Semistructured Interview Study With a Comparison Group

Recruitment

Participants were recruited using purposive sampling, first with the aim of maximum variation [14,15], based on age [16,17], gender [18], and condition severity [19] as these factors have been found to influence Web usage. However, as this recruitment strategy proved difficult to acquire participants overtime, potential participants who met the inclusion criteria were later considered for participation as well. Participants were recruited using posters placed on message boards around the university and short recruitment messages broadcasted via the university's intranet news feed and social media accounts. Participants were recruited in the United Kingdom based on the following criteria: they were aged ≥ 18 years, skilled Web users, diagnosed with depression and/or an anxiety disorder, and had no sensory or physical impairments that required the use of adaptive or assistive technologies to operate a computer system. It was important only to include skilled Web users to reduce the likelihood that difficulties encountered could be associated with being an unskilled user rather than the targeted conditions. Participants in the comparison group were recruited to match the demographic profile of participants with a diagnosis, but with 1 exception, these participants were encouraged by

recruitment advertisements and the participant information sheet to only consider participating if they were never diagnosed with a mental disorder. Data saturation (ie, no new data, themes, and coding) [20] determined the final number of participants to recruit. Data saturation helps to ensure that the study is supported by adequate and quality data [21].

Screening tools were used to ensure that participants met the inclusion and exclusion criteria. Potential participants in both groups scoring more than 25 on the 10-item abbreviated Web use skills index for the general population [22] were invited to participate. Beck Depression Inventory-II [23] and Beck Anxiety Inventory [24] measure symptom severity at 3 levels (ie, mild, moderate, and severe) and were used for this purpose. Those in the comparison group were assessed for depression and anxiety using the Patient Health Questionnaire for Depression and Anxiety (score between 0 and 2), which has demonstrated high sensitivity and specificity in screening for both conditions [25] and has much fewer items than the other 2 instruments.

Data Collection

Ethical approval was granted by the ethics committee of the University of Southampton. Those who passed screening and gave written consent were invited to participate in a face-to-face semistructured interview lasting between 60 and 90 min. Semistructured interviews allowed researchers to gather rich descriptive data about the experiences of participants when using the Web. The method is also useful for exploring this research domain that is in its infancy [26]. Furthermore, it allows for the flexibility to pursue unexpected experiential paths as shared by the participants without losing focus on the key issues of investigation [26]. A topic guide ([Multimedia Appendix 1](#)) was used to ask questions about the difficulties participants experienced when using the Web during their daily lives. The interviews were conducted in private rooms around the university between June and November 2016 and were transcribed verbatim from digital audio recordings and evaluated for accuracy before being analyzed. Personally identifiable data were removed from transcriptions, and pseudonyms were used for participants.

Data Analysis

Framework analysis as outlined by Ritchie et al [27] is commonly used to analyze stakeholder accounts from in-depth semistructured interviews. Although the technique primarily subscribes to a thematic approach, it also permits identified themes from semistructured interview narratives to be organized around research questions [28]. Aided by VERBI's MAXQDA 12 qualitative research software package, researchers proceeded through 5 stages: (1) familiarization, (2) identifying a thematic framework, (3) indexing, (4) charting, and (5) mapping and interpretation.

Researchers became familiar with collected data by listening to the recordings and reading and rereading transcripts while progressively making initial notes of any thoughts that surfaced. Themes were then identified and questioned. Data were sifted, and selected quotes were sorted and later rearranged thematically [29]. The discovered themes were compared to ensure they accurately reflected the data. The analysis then went into a

deeper interpretative phase focusing on extracts that illuminated participants' accounts in vivid detail.

Study 2—A Mental Health Practitioner Expert Online Survey Study

Recruitment

Purposive sampling, specifically expert sampling [30,31], was used to recruit participants for this survey. Respondents had to be aged ≥ 18 years; had to be an accredited, a chartered, or a registered member of a professional body in the United Kingdom for MHPs; and must have had experience treating people with depression and anxiety. MHPs were considered suitable experts for this study as they aim to improve their patients' mental health through therapy that benefits from a deep understanding of their patients' lived experiences [32]. Therefore, it was expected that MHPs would have a good understanding of the difficulties this group might encounter online as well. We examined the potential difficulties people with depression and anxiety face on the Web, as explained by MHPs included in an online database directory of MHPs between January and October 2016. Data saturation [20] determined the final number of respondents. The Checklist for Reporting Results of Internet E-Surveys [33] for this survey is presented in [Multimedia Appendix 2](#).

Data Collection

Ethical approval was granted by the ethics committee of the University of Southampton. Respondents gave their consent before participating in the Web-based survey, which was conducted between January and October 2016. They then answered questions relating to 2 of the 4 personas that were randomly given. One persona focused on depression and the other on an anxiety disorder.

The survey asked demographic questions (eg, educational background and expertise) and open-ended questions about the personas that were provided ([Multimedia Appendix 3](#)). The 4 personas used were fictional characters (2 with depression and 2 with anxiety) developed for this study by RB based on information about impairments, activity limitations and participation restrictions experienced by people with depression and anxiety, diagnostic criteria associated with these conditions, and also scenarios that featured a wide range of common Web activities.

The International Classification of Functioning, Disability, and Health Core Set for Depression is an internationally accepted and evidence-based selection of functioning domains [34] that covers the spectrum of symptoms and limitations in the functioning of persons with depression. The seminal study on horizontal epidemiology [35] involving systematic literature reviews, content analysis of patient-reported outcomes and outcome instruments, clinical input, and a qualitative study generated a useful group of psychosocial difficulties commonly experienced across brain disorders. The International Statistical Classification of Diseases and Related Health Problems 10th edition is a classification created and maintained by the World Health Organization [36]. The Web activity taxonomy developed by Sellen et al [37], and that later received strong support from Kellar et al [38], was used to animate personas presented to

respondents. Feedback on the first version of the survey was obtained from 2 MHPs who participated in the survey pilot, and some modifications were made as a result.

Data Analysis

The data analysis technique used on the data from the semistructured interviews was also applied to these data.

Results

Summary of Results

A total of 167 difficulties that people with depression and anxiety experienced when using the Web were identified in study 1, and 10 difficulties were identified in study 2. A comparison of these findings will be shared after the findings for each study are detailed below.

Study 1—Semistructured Interview Study With a Comparison Group

This study had a sample of 28 participants (8 males and 20 females) aged between 18 and 69 years (Table 1). A total of 16 females and 5 males were recruited for the sample of people with depression and anxiety. Moreover, 4 females and 3 males were included in the comparison group. An independent samples *t* test was conducted to compare the level of Web skill in the depression and anxiety group with that in the comparison group. There was no significant difference in the level of Web skill in the depression and anxiety (mean 40.10, SD 6.94) group and comparison (mean 41.14, SD 9.26) group ($t_{26}=0.32$; $P=.75$, 2-tailed). A comparison of the identified difficulties encountered by participants in both groups reveals that they have noticeably different experiences when using the Web.

Table 1. Sample demographics of the semistructured interview study with a comparison group.

Characteristics	Depression and anxiety group (n=21), n	Comparison group (n=7), n
Sex		
Male	5	3
Female	16	4
Age (years)		
18-29	11	5
30-49	7	1
50-69	3	1
Condition		
Anxiety	2	— ^a
Depression	9	—
Anxiety and depression	10	—
None	—	7
Condition severity: depression		
Mild	2	—
Moderate	6	—
Severe	11	—
Condition severity: anxiety		
Mild	0	—
Moderate	5	—
Severe	4	—
Frequency of Web usage		
Several times a day	20	6
Once a day	1	1
Several times a week	0	0
Once a week	0	0
Once a month or less	0	0

^aNot applicable.

The 167 difficulties identified from the experiences of participants in the depression and anxiety group were discussed within the context of 81 Web activities, services, and features. The majority of participants in the depression and anxiety group

reported difficult experiences that were captured in each theme (Table 2).

The 16 difficulties identified from the experiences of participants in the comparison group were discussed within the context of 11 Web activities, services, and features. These difficulties were often encountered with momentary negative affect and,

occasionally, resulted in dislike for the particular Web activity, service, or feature. Difficult experiences shared by most participants in the comparison group were represented by theme 1 (Table 2). Each of the remaining 3 themes included difficult experiences discussed by a small number of participants in this group (Table 2).

Table 2. Number of participants in the people with depression and anxiety group compared with number of participants in the comparison group by theme.

Theme	Participants in the people with depression and anxiety group (n=21), n	Participants in the comparison group (n=7), n
Inappropriate and sensitive content	20	6
Lack of safety, privacy, and security controls	20	4
Lack of adequate support	19	1
Difficult user interfaces	17	3

Theme 1: Inappropriate and Sensitive Content

A total of 4 subthemes were identified within this theme: (1) unexpected, irrelevant, and inappropriate content is upsetting; (2) reminders of upsetting experiences and negative affect triggers; (3) social comparison cues on social media that result in increased negative affect; and (4) abusive content limits Web usage by those who avoid it. The majority of participants, 20 out of 21 in the depression and anxiety group and 6 out of 7 in the comparison group, identified inappropriate content as a source of difficulty under this theme. Other subthemes were only reported by participants in the depression and anxiety group who discussed difficulties with sensitive and abusive content (Table 3).

Unexpected, Irrelevant, and Inappropriate Content Is Upsetting

Exposure to inappropriate content was followed by feelings of upset, frustration, and helplessness. This negatively impacted the ability of some participants in the depression and anxiety group to complete tasks for up to a day:

See a photo and it's affected my mood for the rest of the day. I'll be there sat when I go to work, flip through social media, all of a sudden something hits, feel low, go to work and it doesn't pick up and then I can't perform at work and then I get sent home which makes me feel even worse. [Shane, depression and anxiety group]

Participants in the comparison group generally felt upset by inappropriate content but saw such content as being a regular

part of using the Web and appeared better able to quickly overcome these feelings than those in the depression and anxiety group:

Was it upsetting for a long time or was it just that moment? [Moderator]

Just that initial moment. [Marita, comparison group]

Reminders of Upsetting Experiences and Negative Affect Triggers

Exposure to sensitive content resulted in involuntarily recollecting memories of personally meaningful issues that were upsetting for a temporary or prolonged period.

Such sensitive content on the Web is varied and diverse, as shown in Table 3. Some types of sensitive content are also composed to provoke a strong negative emotional response deliberately, for example, graphic content used in news stories and promoted posts on social media related to appeals by causes supporting people and animals in need:

It's almost like some adverts I can't watch because I just think, "I mean, I know they are poor, starving children in Africa"...I'm paying you know, and I'm doing [my] bit. But I literally get to the point, I sit and think, "Oh my God, if that was me, if that was my child," I mean, I would just give away, I could never, I'd just be giving away my clothes. [Clara, depression and anxiety group]

No participant in the comparison group reported a similar difficulty.

Table 3. Difficulties with sensitive and inappropriate content experienced by participants in both sample groups by subtheme.

Subtheme—number of participants from DA ^a (n=21) and comparison (n=7) groups	Difficulty reported by the DA group participants	Difficulty reported by the comparison group participants
Unexpected, irrelevant, and inappropriate content is upsetting (DA group: 17/21 and comparison group: 6/7)	<ul style="list-style-type: none"> Exposure to upsetting offensive content from social connections (eg, violence, trifle, overshare, exaggeration, and constant help seeking), news websites (eg, violence, headline marquee, articles, and political bias), and advertising (eg, prominently positioned, excessive amounts on page, disguised, misleading, obstructive, persistent, distracting, and intrusive) Notifications highlighting insignificant information on social media platforms Unexpected and inappropriate search results 	<ul style="list-style-type: none"> Exposure to offensive content and personally critical comments from social connections, online dating counterparts (eg, sexual content and inappropriate contact), news websites (eg, untrustworthy articles, political bias, and violent acts), and advertising Notifications from social media platforms
Reminders of upsetting experiences and negative affect triggers (DA group: 14/21 and comparison group: 0/7)	<ul style="list-style-type: none"> Inappropriate help-seeking behavior on social media by those with similar negative experiences Social media features—highlighting content such as status updates, images, and posts from social connections from current date in the past—that trigger memories of upsetting experiences Personally relevant content (eg, status updates, images, posts from friends, adverts, and news articles) that triggers negative affect 	— ^b
Social comparison cues on social media that result in increased negative affect (DA group: 7/21 and comparison group: 0/7)	<ul style="list-style-type: none"> Social media content (eg, images, information on healthy lifestyle practices, and past positive life experiences) highlighting perceived personal faults Social media content (eg, images) highlighting opportunities that are no longer available to one's self but to others who are similar Instructive content, especially user-generated, that is related to sensitive topics (eg, child-rearing) and that is contrary to personal practices 	—
Abusive content limits Web usage by those who avoid it (DA group: 5/21 and comparison group: 0/7)	<ul style="list-style-type: none"> Avoidance of unfamiliar and news-related websites because of the fear of unintentionally accessing personally upsetting and inappropriate content Avoidance of social media participation because of the fear of receiving abuse 	—

^aDA: depression and anxiety.^bNot applicable.

Social Comparison Cues on Social Media That Result in Increased Negative Affect

Some content was effective at directing attention toward drawing upward comparisons between several participants in the depression and anxiety group and others, and participants in the depression and anxiety group and themselves in past. These comparisons were often negative and considerably upsetting:

I had one that came up this week that was a photograph of me, many years ago. Friend's wedding. I was a bridesmaid. I just looked at this photograph and went, I mean, I looked good...I immediately felt that I'd let myself down. I thought, "Well look, clearly you can manage this. What's happened?" [Clara, depression and anxiety group]

No participant in the comparison group reported a similar difficulty.

Abusive Content Limits Web Usage by Those Who Avoid It

Some participants also refrained from commenting, posting updates, and engaging in various Web-based activities in fear of suffering abuse from other Web users as a result:

I left a comment, and then I just had a stream of abuse from people, because I voted to leave... The Web, in general, is quite a hostile place, and I don't want to be in that sort of environment. It doesn't make me feel particularly safe or comfortable, being online. As I said, I stick very much to what I know, because I feel quite unsafe outside of that. [Jason, depression and anxiety group]

No participant in the comparison group reported a similar difficulty.

Theme 2: Lack of Safety, Privacy, and Security Controls

A total of 4 subthemes were identified within this theme: (1) lack of control over access and usage, (2) lack of safety controls, (3) threats to privacy, and (4) ambivalent contact. Ensuring safety for oneself and significant others when using the Web was described as a difficult task only by participants in the depression and anxiety group, as shown in Table 4. Similarly, except for 1 participant from the comparison group, difficulties pertaining to contact were reported by several participants in the depression and anxiety group (10/21).

Lack of Control Over Access and Usage

Table 4 shows several recreational activities on the Web that several participants (19/21) from the depression and anxiety group said displaced important tasks. Participants were unable to stop engaging in these activities even when they wanted to stop. Some participants said that these activities were an outlet for coping with unpleasant feelings and procrastination:

I discovered YouTube over the winter exams...When I'm overloaded in other areas, it's like a release...I know I'm doing it. That does not mean I can stop.
[Sara, depression and anxiety group]

A high-level of ease of use was also attributed to making unintended purchasing, banking, and time management decisions, without giving due consideration. These features were considered as being too easy not to use:

There's the one-click, it's so easy just to go through and buy and buy and buy, and buy loads of stuff that you can't really afford...Like I said, I have a tendency, sometimes, to make impulse purchases, and I'll look and think I've got more money than I have, and before I know it I'm at the bottom of my overdraft again.
[Jason, depression and anxiety group]

Lack of Safety Controls

Some participants discussed how they grappled with complex issues relating to the differences in privacy approaches between countries and companies and the repercussions for what they self-disclosed to websites based on these factors. Other participants were concerned about keeping their children safe but admitted that they were unable to remain motivated to keep abreast of the constant changes in how safety was managed and circumvented on various websites. Several participants expressed their interest in realizing the wider benefits of the Web. However, they were forced to strictly limit their use of many websites, such as social media websites, and others narrowed their use of the Web to a limited number of websites in fear of abuse and receiving unsolicited contact.

The fear of being a victim of crime and getting involved in a conflict on the Web is equally as concerning as avoiding abuse and unsolicited contact. The result of dealing with this fear is often also limiting Web use. A lack of forewarning about the known types of service misuse, information on how to avoid safety pitfalls associated with the usage of Web-based services and a lack of support options in the event the user is negatively

affected also presented difficulties for depression and anxiety group.

As demonstrated with theme 1, it is important that participants have a choice in what content they are exposed to, especially on social media platforms, as the emotional consequences can be profound. Participants were exposed to sensitive content regularly and were unable to avoid it effectively. The highly varied nature of sensitive content on the Web and the lack of control over exposure to it were the main reasons given for why this occurred:

People post videos of the dogs being boiled alive to raise awareness...It's a really upsetting video, you don't have the possibility to not want to play it, you got auto play on and you scroll through it, it would just start playing. [Jade, depression and anxiety group]

No participant in the comparison group reported a similar difficulty.

Threats to Privacy

Participants in both groups were generally concerned about the privacy of their personal data. Participants in the depression and anxiety group identified many instances of where they particularly felt vulnerable, as shown in Table 5.

However, these participants sometimes also failed to take necessary precautions because of their felt sense of personal insignificance:

In terms of difficulties, it's really kind of finding minor details for terms and conditions for various services and various things that you use online, whether it's the rights that a social media platform has for your data or the rights of a purchasing website to then use your details in marketing. It's very buried, I find.
[Betty, depression and anxiety group]

Ambivalent Contact

Several participants (10/21) in the depression and anxiety group experienced much difficulty with direct contact from social connections and stopping consistent contact from unknown senders:

My partner almost caused me to lose my life...I don't follow him, I'm not friends with him. And then suddenly, about two weeks ago. On the bottom of photo, he wrote something...That's really unsettling.
[Hera, depression and anxiety group]

If somebody messaged me personally I would always respond...I think it gets worse when I'm low...I find social interactions quite draining, when I'm already tired, because you kind of in a way have to put up a bit of a façade, which is obviously very hard to maintain. [Paisley, depression and anxiety group]

Moreover, 1 out of 7 participants in the comparison group identified avoiding spam via social media platforms as being a difficult task.

Table 4. Difficulties because of a lack of safety, privacy, and security controls experienced by participants in both sample groups by subtheme.

Subtheme—number of participants from DA ^a (n=21) and comparison (n=7) groups	Difficulty reported by the DA group participants	Difficulty reported by the comparison group participants
Lack of control over access and usage (DA group: 19/21 and comparison group: 1/7)	<ul style="list-style-type: none"> • Addictively accessing similarly upsetting content (eg, news articles on similar topics) that is readily available • Repeatedly clicking on posts and performing other actions on social media, news, and shopping websites • Addictively performing online tasks that displace other tasks—gaming, gambling, and watching videos • Keeping track of time on social media is difficult • Coping with anxiety by fixating on finding answers to a salient issue online and avoiding activities (eg, accessing bank account in anticipation of a low balance) • Easy achievable compulsion to set up bank overdrafts, make online purchases, and donate to charities • Avoid online civic engagement because of a sense of insignificance • Personal online shopping results in feelings of guilt • Reluctantly using online dating when feeling low to increase feelings of self-worth 	<ul style="list-style-type: none"> • Addictively accessing social networking services and news websites
Lack of safety controls (DA group: 11/21 and comparison group: 0/7)	<ul style="list-style-type: none"> • Understanding how to protect one's family from online dangers and being confident enough to do so • Unable to anticipate if a news article will be upsetting • Detecting scams and phishing attempts on banking platforms • Limiting Web usage by only using familiar websites to avoid unknowingly committing criminal acts • Lack of control over exposure to content • Trusted websites that occasionally feature links to unsafe websites 	— ^b
Threats to privacy (DA group: 10/21 and comparison group: 1/7)	<ul style="list-style-type: none"> • Fear that data from personal data breach would be sold to third parties, or fear of being hacked • A sense of insignificance discourages the implementation of privacy measures on social media platforms • Frustrating when personal data sharing, including seemingly unnecessary personal data, is required to participate in online activities • Targeted advertising using posts, especially posts shared during a depressive episode • Distressing having comments publicly visible • Finding and understanding terms and conditions policies and keeping abreast of changes 	<ul style="list-style-type: none"> • Ensuring privacy and safety online—identifying scams and scammers
Ambivalent contact (DA group: 10/21 and comparison group: 1/7)	<ul style="list-style-type: none"> • Fear of direct contact or contact beyond a “like” or similar form of engagement, from social connections, especially during a depressive episode • Uncertainty about how to stop contact—being removed from electronic mailing lists • Mandatory contact to obtain resources—subscription to electronic mailing lists • Making contact—connecting with people through video clips and reading news instead of direct contact, avoid responding to messages as it is mentally effortful, and pressured to respond to messages immediately 	<ul style="list-style-type: none"> • Avoiding spam via online social networking sites

^aDA: depression and anxiety.^bNot applicable.

Table 5. Difficulties because of having a lack of adequate support experienced by participants in both sample groups by subtheme.

Subtheme—number of participants from DA ^a (n=21) and comparison (n=7) groups	Difficulty reported by the DA group participants	Difficulty reported by the comparison group participants
Lack of support for error recovery and overcoming emotional difficulties (DA group: 17/21 and comparison group: 3/7)	<ul style="list-style-type: none"> Managing subscriptions is frustrating—lack of forewarning, automatic renewals, and difficulty requesting and obtaining refunds Remembering many passwords and special codes Lack of clear warnings about the risks associated with online dating on particular platforms and of support when things go wrong Posting content is mentally effortful and time-consuming—choosing emoji, expressing feelings without causing alarm, and fear of using incorrect grammar Immediately quit or desperately and hastily try many strategies to complete challenging tasks Having too many options and information results in indecisiveness and distraction Impersonal social messaging feature makes taking the first step to seek help from connections difficult Feeling ignored when social connections do not react to personal posts Sharing content is a struggle—highlighting personal positives, fear of attracting abuse and attention from others, making offense or causing conflict, and fear of sharing inaccurate and uninteresting content Difficulty learning from onscreen material because of an inability to engage actively Difficulty getting support online, given the inflexibility of online banking and education support systems that are often not user-friendly Unable to accurately gauge reactions when interacting with others via online dating platforms Fear of opening messages and being pressured to respond to a message immediately as a read receipt has been sent 	<ul style="list-style-type: none"> Fast time-outs
Information gathering on the Web (DA group: 12/21 and comparison group: 3/7)	<ul style="list-style-type: none"> Choosing the right search keywords for difficult-to-find resources Time-consuming to assess the veracity of information on the Web Hard to keep focus and understand information online during a depressive episode Getting distracted when navigating across many websites to find needed information Search results listing multiple sources with identical information and few sources with original content Assessing the availability of resources across multiple academic databases Not knowing when to stop searching for and evaluating online resources Quit searching the Web in frustration after not finding needed results Processing too much information from many sources makes it difficult to ascertain if one's search is complete Easily distracted when browsing the Web during a depressive episode Sites that break up content across pages to increase advert views 	<ul style="list-style-type: none"> Selecting the effective Web search terms Missing information—important information that should be online but is not Reading multipage articles

^aDA: depression and anxiety.**Theme 3: Lack of Adequate Support**

A total of 2 subthemes were identified within this theme: (1) lack of support for error recovery and overcoming emotional difficulties and (2) information gathering on the Web. The majority of participants (17/21) in the depression and anxiety group and 3 out of 7 participants in the comparison group highlighted that a lack of meaningful support made using the Web challenging (Table 5). Difficulties with information gathering online were also identified by 12 out of 21 participants

in the depression and anxiety group and 1 out of 7 participants in the comparison group.

Lack of Support for Error Recovery and Overcoming Emotional Difficulties

Several participants in the depression and anxiety group believed that they were not given the necessary support by websites to overcome difficulties, especially when they were feeling unwell:

I make lots of mistakes don't get me wrong. I got delivered five kilos of bananas the other day...They could have a "do you need" button before you submit... "Are you sure you need five kilos or five bananas?" [Christine, depression and anxiety group]

They also pointed out that websites often compounded this situation by not automatically correcting obvious user errors and, instead, sometimes made completing tasks more effortful as a result. Existing support options were not helpful as they were often not user-friendly and did not address difficulties common to participants. These participants shared that remaining motivated to solve the reported difficulties independently of others was challenging:

It depends on how tired I am. If I can't get what I want immediately I give up. Then I'll shelve it, and I'll come back. If I need it really urgently, then I just try lots of different things. [Hera, depression and anxiety group]

Several participants (3/7) in the comparison group shared difficult experiences with form timeouts that terminated too quickly.

Information Gathering on the Web

Gathering information using the Web, especially via search engines and reading multipage articles, proved challenging for participants in both groups (Table 5):

Things that I find difficult are getting that...putting the right stuff into your search...So that you get the information you want, and when you know something's out there, but you can't easily get to it. [Hera, depression and anxiety group]

Then there's one picture on one page then you have to scroll to another page to the next part of the article...I find that really frustrating. [Christine, depression and anxiety group]

Participants (12/21) in the depression and anxiety group experienced additional difficulties in remaining focused when searching the Web using databases and browsing across multiple websites (Table 5):

Where you have to click to go to the next. You know they're just doing that, I feel, to measure their clicks so they know how far you're getting in the story, is what I feel. Especially if I'm just doing it on my

phone. I have a cheaper phone. It's not so fast. I think, "Oh okay, forget it." This is annoying when you could just put the content right there one page. [Kurt, depression and anxiety group]

Theme 4: Difficult User Interfaces

A total of 2 subthemes were identified within this theme: (1) using complicated and effortful user interfaces on the Web and (2) malfunctioning websites. Participants in both groups recounted frustrations using complicated and malfunctioning websites (Table 6).

Using Complicated and Effortful User Interfaces on the Web

Unintuitive websites presented difficulties for participants in both groups (Table 6). Participants (14/21) in the depression and anxiety group recalled experiences involving taking regular breaks and frustratingly struggling until they were able to complete tasks such as reading and shopping online:

Why do we have to have pop-ups? It kind of perplexes me why it's so invasive. You just kind of feel like...You almost want to flip channels but you can't. [Betty, depression and anxiety group]

You can sit down with a fixed idea of what you would like and then by looking on the web you've got so many different products...You then pull back from the decision because there's too much to decide from. [Jason, depression and anxiety group]

Participants in the comparison group (3/7) discussed difficulties completing long website forms and constantly changing user interfaces for frequently used services.

Malfunctioning Websites

Participants in both groups identified difficulties with unresponsive websites, feedback, and page loading errors (Table 6). Experiences with malfunctioning websites sometimes led to catastrophic thinking and a reduced willingness to troubleshoot by those in the depression and anxiety group:

I tend to try and avoid going onto my app or looking at my bank statement as much as possible because it makes me really worried. I've actually seen it takes twice as long to log you in so it's almost like the wait and the panic that what little money you've got is taking longer. [Trish, depression and anxiety group]

Table 6. Difficulties with challenging user interfaces experienced by participants in both sample groups by subtheme.

Subtheme—number of participants from DA ^a (n=21) and comparison (n=7) groups	Difficulty reported by the DA group participants	Difficulty reported by the comparison group participants
Using complicated and effortful user interfaces on the Web (DA group: 14/21 and comparison group: 3/7)	<ul style="list-style-type: none"> • Unintuitive user interfaces for education on the Web—time-consuming to find course materials, complicated academic databases, and difficult reading via Web-based reading services • Unintuitive user interfaces for banking on the Web—intimidated by terminology and abundance of numbers, unclear system feedback, and setting up new bank recipient is complicated • Relearning user interfaces after changes is difficult, especially when lacking the motivation to explore 	<ul style="list-style-type: none"> • Completing long website forms • Constant user interface changes
Malfunctioning websites (DA group: 11/21 and comparison group: 2/7)	<ul style="list-style-type: none"> • Sites not optimized for mobile browsing and poor connectivity • Malfunctioning critical website feature delaying completion of an important task • Frustrating to be given options that are not available • Bad video streaming experiences because of poor connectivity • Catastrophic thinking because of malfunction or irregularities in the operation of the website • Remaining motivated to independently resolve complicated problems caused by websites 	<ul style="list-style-type: none"> • Unresponsive websites • Page loading errors

^aDA: depression and anxiety.^bNot applicable.

Summary: The Most Common Difficulties People With Depression and Anxiety Encounter When Using the Web

A total of 8 subthemes describe difficulties experienced by more than half of the participants in the depression and anxiety group (Table 7).

Web Activities, Services, and Features for Which the Highest Number of Difficulties Were Reported

Web activities, services, and features being used by participants when they experienced difficulties were also reported (Table 8). Table 8 shows 19 of these for which a higher number of difficulties were reported than the average number of difficulties reported for a Web activity, service, or feature.

Table 7. Most common difficulties by subthemes with number of participants in both groups affected.

Difficulty subtheme	Participants in the people with depression and anxiety group affected (n=21), n	Participants in the comparison group affected (n=7), n
Lack of control over access and usage	19	1
Unexpected and irrelevant content is upsetting	17	6
Lack of support for error recovery and overcoming emotional difficulties	17	1
Features and content that are reminders of upsetting experiences and negative affect triggers	14	0
Understanding complicated user interfaces on the Web	14	2
Information gathering on the Web	12	2
Malfunctioning websites	11	2
Lack of security controls	11	0
Privacy risks	10	1
Ambivalent contact	10	1
Social comparison cues on social media that result in increased negative affect	7	0
Abusive content limits Web usage by those who avoid it	5	0

Table 8. Web activities, services, and features for which the highest number of difficulties were reported.

Web activities, services, and features	Difficulties reported from the people with depression and anxiety group (n=167), n	Difficulties reported from the comparison group (n=16), n
Facebook	56	3
General Web usage	22	2
News sites	19	0
Adverts	17	0
Online learning	17	0
Online banking	16	2
Online shopping	16	1
Conducting research online	13	0
Content sharing by connections on social networking services	11	1
Posting content	10	0
Business-related Web usage	9	0
Online search	11	0
Online dating	8	0
YouTube	8	0
Twitter	7	1
Online civic engagement	6	0
Commenting feature	6	0
eBay	5	0
Instagram	5	0

Study 2—A Mental Health Practitioner Expert Web-Based Survey Study

Data were collected from 21 respondents (4 males and 17 females) aged between 30 and 72 years using purposive sampling (Table 9).

MHPs reported 10 perceived difficulties relating to Web usage by the people with depression and anxiety. Of these, 2 difficulties were only relevant to personas diagnosed with depression. The remaining 8 difficulties were shared by personas diagnosed with either depression or an anxiety disorder. The 10 perceived difficulties were linked to 22 common impairments, limitations in activities of daily life, and diagnostic criteria associated with depression and anxiety. These difficulties are organized under 3 themes: (1) navigating and generally operating websites, (2) content on the Web, and (3) lack of trust in the Web.

Theme 1: Navigating and Generally Operating Websites

MHPs (n=19) identified 5 perceived difficulties within this theme that focus on the general usage of websites by people with depression and anxiety (Table 10). All 4 personas are captured in this theme.

Navigating the Web

Using the Web was generally seen by experts (n=10) as involving many effortful activities that could pose challenges for how people with depression and anxiety perceived, understood, and used Web-based resources. For example, Web browsing was often pinpointed as a potentially difficult task. Personas with either condition were thought to be lacking the necessary motivation and energy to effectively use Web-based resources and the ability to solve emergent problems. Experts believed that these difficulties could be compounded by impaired emotion regulation, poor concentration, and the physical manifestations of their conditions, for instance, an upset or worried user experiencing difficulty navigating a website along with finding it hard to concentrate on the task at hand.

Malfunctioning and Unintuitive Sites

Malfunctioning websites and websites with an unintuitive design were also thought by experts (n=7) to be especially difficult for people with depression and anxiety to use. These websites were described as using too small font sizes, unnecessarily bright colors, and many shapes within its design. The experts expressed concern that members of this group were often fatigued and might also struggle with remaining resilient when encountering these experiences. Feelings of hopelessness, worthlessness, and worry were mentioned as possible outcomes.

Table 9. Sample demographics of mental health practitioner expert Web-based survey study.

Characteristics	Mental health practitioner experts (n=21), n
Sex	
Male	4
Female	17
Age (years)	
30-49	2
50-69	16
≥70	3
Years of experience	
5-10	3
11-15	5
>15	13
Profession	
Counselor	10
Clinical psychologist	1
Psychiatrist	1
Psychotherapist	8
Occupational psychologist	1
Country	
United Kingdom	20
Ireland	1

Table 10. Perceived difficulties navigating and generally operating websites.

Perceived difficulties	Associated impairments, limitations in activities of daily life, and diagnostic criteria
Navigating the Web ^{a,b}	Lack of motivation, lack of energy, impaired emotion regulation, poor concentration, physical symptoms (eg, tingling or numb fingers, dizziness, and shortness of breath), and difficulty solving problems
Malfunctioning and unintuitive sites ^{a,b}	Poor concentration, lack of motivation, low resilience, worry, low mood, low self-confidence, low self-esteem, fatigue, feelings of hopelessness and feelings of worthlessness
Effortful tasks ^{a,b}	Lack of motivation, worry, impaired emotion regulation, poor concentration and feelings of hopelessness
No clear guidance on how to complete tasks ^a	Poor concentration and feelings of hopelessness
Excessively detailed websites with information/design elements ^{a,b}	Feelings of being overwhelmed and lack of energy

^aDifficulty reported for persona with depression.^bDifficulty reported for persona with an anxiety disorder.

Effortful Tasks

Several common online activities were highlighted by experts (n=7) as possible areas of difficulty because of the sustained mental effort involved. These activities included seeking help online for technical and personal issues, reading, completing forms, and conducting online research. Experts noted that feelings of hopelessness and worry coupled with a lack of motivation and poor concentration might make these activities challenging for those affected by depression and anxiety.

No Clear Guidance on How to Complete Tasks

The potential for a Web activity to pose difficulty was thought to be increased when no clear guidance on how to complete the necessary tasks was provided. Experts (n=4) believe that this fosters a feeling of hopelessness within users with depression and anxiety.

Excessively Detailed Websites With Information/Design Elements

Some experts (n=3) also characterized websites featuring excessive amounts of information and design elements as being

barriers to effective use. It was feared that information overload would be the likely result and that it would overwhelm people with depression and anxiety who tend to be already low on energy.

Theme 2: Content on the Web

MHPs (n=10) identified 3 perceived difficulties within this theme relating to the perception and comprehension of website content by people with depression and anxiety (Table 11). All 4 personas are captured in this theme.

Table 11. Perceived difficulties with content on the Web.

Perceived difficulties	Associated impairments, limitations in activities of daily life, and diagnostic criteria
Retaining information ^{a,b}	Poor concentration, worry, fatigue, low self-confidence, and physical symptoms (eg, tingling/numb fingers, dizziness, and shortness of breath)
Content that does not resonate ^{a,b}	Negativity bias, lack of motivation, impaired emotion regulation, low self-esteem, feelings of being overwhelmed, and feelings of isolation
Content that triggers repetitive thinking ^{a,b}	Impaired emotion regulation

^aDifficulty reported for persona with depression.

^bDifficulty reported for persona with an anxiety disorder.

Retaining Information

The experts (n=4) shared that retaining information on websites would be difficult for users with these conditions. Symptoms including poor concentration, worry, fatigue, and physical symptoms such as dizziness were cited as factors that contribute to this outcome.

Content That Does Not Resonate

Experts (n=9) believed that online content lacking personal meaning or importance to users and content that users perceived as overly positive or negative would present several challenges for this group. Experts stated that this kind of unbalanced content could be demotivating, overwhelming, and isolating for this group. Overly negative content was believed to have the added potential to affirm negative fears and concerns. This difficulty was noted for all personas as well:

He may have difficulty feeling the wording on a website applies to him if he does not feel directly

spoken to in an understanding way by what is written on a website. [MHP 1]

Content That Triggers Repetitive Thinking

Content that is reminiscent of negative personal experiences was highlighted as a potential challenge by an expert (n=1) for 2 of the personas. Words or phrases that might be associated with these experiences were deemed to have the potential to easily take users on a negative mental tangent where they would repeatedly focus and refocus on negative personal experiences. This kind of repetitive negative thinking [39,40] is believed to present difficulties for concentration and the comprehension of online content as well.

Theme 3: Lack of Trust in the Web

MHPs (n=4) identified 2 perceived difficulties within this theme relating to information sharing by users and their safety online (Table 12). A total of 3 personas—2 diagnosed with depression and 1 an anxiety disorder—are captured in this theme.

Table 12. Perceived difficulties relating to a lack of trust in the Web.

Perceived difficulties	Associated impairments, limitations in activities of daily life, and diagnostic criteria
Self-disclosure online ^{a,b}	Worry, perfectionism, and low self-confidence
Feeling safe online ^a	Worry, feelings of vulnerability, and withdrawal

^aDifficulty reported for persona with depression.

^bDifficulty reported for persona with an anxiety disorder.

Self-Disclosure Online

Sharing personal information online was highlighted as a potential challenge for people in this group. It was mentioned that users might experience great worry about how their information might be used beyond what was intended. Sharing personal information in what seems to be a public setting may also be difficult for users who are experiencing low self-confidence issues. It was also mentioned that some users might worry about making mistakes and become overly concerned about completing information collection forms correctly.

Feeling Safe Online

Ensuring one's safety was also identified as a potential difficulty for people with depression. Fear of privacy violations, exploitation, deception, and crime were some of the issues highlighted. Experts say these fears foster intense feelings of worry and vulnerability that can be mentally debilitating and are believed to result in users withdrawing from some aspects of the Web.

Discussion

Principal Findings and Comparison With Prior Work

This investigation identified and described many of the difficulties people with depression and anxiety experience on the Web through triangulation using 2 data sources. First, study 1 benefited from face-to-face interviews with comparison group participants that were used to highlight unique difficulties identified in face-to-face interviews with participants from the depression and anxiety group. Second, study 2, a persona-based Web-based expert survey, involved MHPs who identified many difficulties that were also reported by the people with depression and anxiety in study 1 and further described these difficulties from a clinical perspective. Findings from this investigation have contributed to a more robust and fuller understanding of the difficulties people with depression and anxiety experience online and provide actionable insight to researchers, engineers, policy makers, and clinicians in their practice.

Participants in the depression and anxiety group reported a higher number of the identified difficulties compared with those in the comparison group. Furthermore, difficulties reported by participants in the depression and anxiety group were discussed within the context of a larger number of Web activities, services, and features when contrasted with the difficulties reported by the participants in the comparison group. In line with research on resilience [41,42], difficulties reported by participants in the depression and anxiety group were more detailed and considered to be more detrimental by those in this group when contrasted with those reported by participants in the comparison group.

Perceived difficulties identified by MHPs in study 2 showed considerable overlap with those identified in study 1 by participants in depression and anxiety group. Nonetheless, the investigation benefited a great deal from using triangulation. People with depression and anxiety clearly detailed the difficulties they experienced, at times also mentioning the harmful consequences, and MHPs suggested linkages between difficulties reported by the people with depression and anxiety and the common impairments, limitations in activities of daily life, and diagnostic criteria associated with their conditions.

Inappropriate and personally sensitive content was instrumental in triggering persistent and cyclic negative thinking that is characteristic of rumination in depression and anxiety [43] and was linked to impaired emotion regulation by MHPs in study 2. This content was also found to encourage negative social comparisons that exacerbated anxiety symptoms and negatively affected daily functioning [44]. Researchers [45] have found that the more Web users with the inclination toward social comparisons engage in this behavior online, the more they experience negative feelings. Findings from some studies [46] also show that exposure to content that supports clear social comparisons is more detrimental to women with a high tendency to compare themselves with others, relative to women without this tendency.

MHPs in study 2 tied the concern of people with depression and anxiety for safety and privacy controls on the Web to a general lack of trust in the Web. Similar to this investigation's

findings, research [47] has associated psychological distress with frequent unwanted contact or communications overload because of the usage of multiple online communication channels. Receiving unwanted contact and misunderstandings were identified as the most common negative Facebook experiences reported by young adults in another study [48] and were associated with depressive symptoms as well. The fear of receiving negative feedback online and coping with the pressure to maintain social network updates has also been reported in other studies [49,50]. Moreover, research [51] has also revealed that social anxiety is positively related to a concern for privacy on the Web and that this concern is negatively related to self-disclosure online as well. Safety issues on the Web for people with depression and anxiety also involve distracting features of social media that facilitate procrastination and are likely being used to avoid stressful but necessary tasks [52]. Andreassen and Pallesen [53] found that investing too much time and effort into using social media can negatively impact other social activities, relationships, and well-being. Moreover, despite not being identified by MHP, people with depression and anxiety in other studies [54,55] also shared experiences that involved compulsive buying behavior.

People with depression and anxiety identified many features—regarding making subscriptions easier to manage, issuing notices about known risks on platforms, ability to easily reduce options to choose from, and the ability to have more flexible service support options—that could be implemented to help them overcome many of the difficulties they face when using the Web. Although MHPs did not identify the majority of the difficulties in this theme, these practitioners highlighted difficulties people with depression and anxiety might experience with understanding excessively detailed websites [56] and navigating the Web, which were also mentioned by the people with depression and anxiety.

Both people with depression and anxiety and MHPs identified malfunctioning, unintuitive, and effortful to use sites as descriptions of websites that may pose difficulties to people with depression and anxiety. MHPs suggest the interaction between several characteristics of depression and anxiety (eg, fatigue, poor concentration, and lack of motivation) [9,36] and the aforementioned features of the Web as the reason for the resulting difficulties as described in this paper.

The most common difficulties experienced by participants with depression and anxiety in study 1 were encountered when using the most common Web activities, services, and features mentioned when talking about difficulties. For example, unexpected content is especially common on social networking platforms, news sites, and in online advertisements. Given that the sample had a majority of young participants, the most common Web activities, services, and features where they experienced difficulties were somewhat expected.

Limitations

Though the study benefited from having a mostly young and predominantly female sample in several ways, this may have limited the range of Web activities the sample engaged in and, therefore, also the range of difficulties identified. Similarly, the difference in sample size between the participant groups in study

1 may have also limited the range of difficulties identified for the smaller comparison group. However, data saturation determined the final number of participants for each group, and therefore, no new information that would have enhanced or changed the findings of a study was expected. Nevertheless, this is one of the first studies of its kind, and this population can serve as a good example for future studies with more diverse and larger samples. Moreover, as the small sample sizes in study 1 limit the ability of the independent samples *t* test to detect a statistical difference in Web skills between the depression and anxiety and comparison groups, the results of this analysis should be cautiously interpreted.

Although unlikely, participants in the comparison group could have misreported a past mental disorder diagnosis. However, these participants were also screened using the Patient Health Questionnaire for Depression and Anxiety, and all of them had a score between 0 and 2 at the time of study.

Despite piloting, some MHPs in study 2 deemed the survey as being too long. This sometimes resulted in receiving a few repetitive responses and complaints about the amount of effort necessary to complete the survey. Conducting screening that considers the necessary levels of attentiveness and effort that are needed for such surveys is of utmost importance for future studies involving this group.

Given these limitations, it is important to note that using data triangulation would have also helped reduce the negative impact of these limitations and improved the robustness of this study's findings as well.

Implications and Recommendations for Practice and Future Research

Findings of this investigation are accessible to researchers in different disciplines to build on, engineers working on the development of accommodating Web-based resources, clinicians who need to be informed about the challenges their patients face in everyday life, and policy makers who can create evidence-based policies that can together realize very positive outcomes for people with depression and anxiety. These findings also place the spotlight on the importance of considering difficulties associated with affective states when delivering enablement initiatives involving the use of technology. This is in contrast to the substantial degree of attention given to the needs of those with sensory impairments and physical

disabilities. Researchers are also encouraged to adopt a more comprehensive view of accessibility that captures the complexity of the interaction between users and their environment.

The International Classification of Functioning, Disability, and Health's Model of Functioning and Disability provides a clear framework that can be used to describe and study the user experience of people with mental health conditions when using Web-based and other digital technologies. For example, the World Wide Web Consortium's Four Principles of Accessibility [57] focuses on instances where a Web-based resource is not understandable, perceivable, and operable but neglects the other important factors in the interaction between the user and the user's environment.

The high variability in user needs among people with depression and anxiety presents a unique challenge for accessibility professionals. Enablement efforts should be targeted at an individual level and no longer solely at a user group level. Meeting this challenge will call for new facilitation methods that rely on emerging technologies such as artificial intelligence to provide highly personalized experiences for each user with depression and anxiety and also other mental health conditions.

The adoption of stronger data protection policies (eg, [58]) will be of great benefit to people with depression and anxiety who worry about not having enough control over their personal data and having it be misused for privacy violations (eg, fear of unwanted direct contact) among other infractions.

Conclusions

People with depression and anxiety experience difficulties when using the Web that are related to sociocognitive deficits associated with their conditions. Participants in the comparison group did not experience most of these difficulties. MHPs are very aware of the difficulties that people with depression and anxiety are likely to experience when using the Web. Findings highlight several Web activities, services, and features that should be reviewed not only for people with depression and anxiety but also for people affected by other mental disorders and conditions that share similar symptomology. This investigation has contributed to a fuller understanding of these difficulties and provides guidance on what to address for people with depression and anxiety when using the Web. It also calls for novel approaches to aid in the removal and reduction of these difficulties using more carefully personalized experiences.

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Conflicts of Interest

None declared.

Multimedia Appendix 1

Semistructured interview topic guide.

[\[PDF File \(Adobe PDF File\), 173 KB-Multimedia Appendix 1\]](#)

Multimedia Appendix 2

Checklist for Reporting Results of Internet E-Surveys.

[\[PDF File \(Adobe PDF File\), 210 KB-Multimedia Appendix 2\]](#)

Multimedia Appendix 3

Mental health practitioner expert Web-based survey questions.

[\[PDF File \(Adobe PDF File\), 218 KB-Multimedia Appendix 3\]](#)

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Abbreviations

MHP: mental health practitioner
DA: depression and anxiety

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Multimedia Appendix 1. Semi-structured interview topic guide.

Ice Breakers

- What thoughts come to mind when you think about the Web?
- What places do you access the Web from?
- How do you normally access the Web? For example, via your mobile, laptop, work computer, tablet.
- How do you spend your time online?

Difficulties Experienced When Using the Web

So you've indicated on the screening form that you use the Web for several activities: social networking, online dating, job search, gaming, movies, music, books, shopping, online banking, eLearning and education, online civic engagement, information gathering. I would like to now go through these activities.

- How often do you use the Web for _____?
- Can you tell me a bit about when you use the Web for this activity?
- Could you describe any positive and or negative experiences you may have with this activity? [*Probe: What do you have trouble with? What tasks often lead to mistakes? What tasks do you avoid? What tasks would you like help with when using the Web?*]
- Have you noticed any changes in your experience of these difficulties? [*Probe: Are they getting worse, better, going away or returning?*]
- If it was up to you, what would you change to help you remove or reduce this difficulty?

Privacy, Cyber-security and safety

- What are your thoughts on online privacy, security and safety?
- What steps have you taken to ensure your security and safety online?

Multimedia Appendix 2. Checklist for reporting results of Internet e-surveys (CHERRIES).

Table 1. Checklist for Reporting Results of Internet E-Surveys (CHERRIES) - Study 2.

Item Category	Checklist Item	Explanation
Design	Describe survey design	Purposive sampling was used to recruit participants for this survey. Respondents had to be aged 18 or above, a mental health professional who is an accredited, chartered or registered member of a professional body and currently treats people with depression or an anxiety disorder. Data saturation determined the final number of respondents.
IRB (Institutional Review Board) approval and informed consent process	IRB approval	Ethical approval was granted by the ethics committee of the University of Southampton.
	Informed consent	Potential participants were emailed the participation information sheet (PIS) — study description, reasons for contact, description of participation, benefits of participating, likely risks, terms of confidentiality, options for further information — and asked to consider participating for at least 24 hours before making a decision. After this time they were permitted to use a link in the email to the Web-based informed consent form — indicated understanding of PIS and opportunities to obtain further information and voluntary nature of participation, agreement to participate —, which was activated 24 hours after the email was sent. Only those giving consent were allowed to progress to participate in the Web-based survey.
	Data protection	The study will be compliant with the Data Protection policy of the School of

		Psychology, University of Southampton and the Data Protection Act (1998). All data will be stored on a password-protected device in encrypted format. No hard copies of survey responses will be stored.
Development and pre-testing	Development and testing	The survey asked demographic questions (e.g., education background and expertise) and open-end questions about the personas that were provided (see Multimedia Appendix 3). The 4 personas used were fictional characters (2 with depression and 2 with anxiety) developed for the present study by RB based on information about impairments, activities limitations and participation restrictions experienced by persons with depression or anxiety, diagnostic criteria associated with these conditions, and also scenarios that feature a wide range of common Web activities. Feedback on the first version of the survey was obtained from two mental health professionals who participated in the survey pilot and some modifications were made as a result.
Recruitment process and description of the sample having access to the questionnaire	Open survey versus closed survey	The survey was essentially an “open survey” but was only accessible by those with a special link.
	Contact mode	Respondents were recruited from an online database directory of mental health professionals who are accredited, chartered or registered members of a professional body in the United Kingdom. Potential participants were contacted by the managers of the online database directory via email.
	Advertising the survey	Potential participants were contacted by the managers of the online database directory via email.

Survey administration	Web/E-mail	A website was used.
	Context	The survey was built and hosted using an online survey platform.
	Mandatory/voluntary	Participation was voluntary.
	Incentives	Participants were notified that there were no direct benefits associated with their participation. They were informed that they would be making a crucial contribution to the field of Web accessibility where the Web can be further developed to better accommodate people with depression and anxiety.
	Time/Date	The survey ran between January and October 2016.
	Randomization of items or questionnaires	Participants answered questions relating to 2 of the 4 personas that were randomly given. One persona focused on depression and the other on an anxiety disorder.
	Adaptive questioning	Not applicable.
	Number of Items	19 items.
	Number of screens (pages)	3 pages (7, 6 and 6 items respectively)
	Completeness check	All survey items were deemed to be mandatory, and respondents prompted to complete outstanding items before leaving the survey page on which the item was contained.
	Review step	Respondents were able to review and change their answers by navigating to previous and next pages.
Response rates	Unique site visitor	225 unique site visitors. A combination of IP address, location and cookies was used to determine unique visitors.
	View rate (Ratio unique site visitors/unique survey visitors)	Not applicable. Potential participants were invited through an external channel.
	Participation rate (Ratio unique survey page visitors/agreed to participate)	(42/225) 19%

	Completion rate (Ratio agreed to participate/finished survey)	(21/42) 50%
Preventing multiple entries from the same individual	Cookies used	Assigned on the first screen. Uncertain about how long the cookie was valid.
	IP Check	Used to ensure only unique participants completed the survey.
	Log file analysis	Not used.
	Registration	Not used but participants received a special link to gain access.
Analysis	Handling of incomplete questionnaires	Only completed questionnaires were included in the final dataset.
	Questionnaires submitted with an atypical timestamp	No respondents were removed from the survey for completing the items too quickly.
	Statistical correction	No methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample.

Multimedia Appendix 3. Mental health professionals expert Web-based survey.

Getting to know you

What is your age?

18-29

30-49

50-69

70 and over

What is your gender?

Male

Female

Other

How many years experience do you have in the field?

up to 5 years

5 to 10 years

10 to 15 years

over 15 years

What is your current job role?

Which country do you predominantly work in?

Personas

Vishal Mehta

I am 22 and graduated with an undergraduate degree in marketing last year after 3 years of studying in London. I fell in love with the city while studying and want to remain here for the foreseeable future to work or perhaps further my studies. I am originally from Mumbai where my family lives.

I was diagnosed with depression during my first year studying. I remember feeling lonely living in a new city far away from my family and eventually had little motivation for studying. I felt guilty for failing several classes in the first year and was fearful that I might not do well in the remainder of the degree. I had a really low mood during this time and little confidence in my ability to successfully continue my studies. I also lost interest in doing the things I normally enjoyed like football, playing the harmonica and writing.

My doctor assisted me in finding help. I mainly got support from my therapist and close friends from university who were aware of my condition. I did not discuss my condition with my family as I did not want them to worry. Despite feeling better now, I still struggle with depression and often have difficulties with concentration, making decisions and remembering important details.

I rely heavily on the Web for getting support from friends and family. I use Facebook and other online services to connect and stay in contact with friends, who mostly now live outside of London. Though my family is not aware of my condition, engaging and staying up-to-date with what's happening in their lives via their posts on these online services is important to me.

I have been actively looking for a job in London since graduating last year and have encountered several challenges. I often think I am not good at anything and had difficulty being motivated enough to adequately prepare application documents, update my CV and online professional profiles (e.g., LinkedIn), ask for recommendations and solve the problems that emerged along the way. I often feel tired and doing any task is an extra struggle. I haven't checked the status of the positions I finally applied for because I probably was not successful. Like who is going to select me? I am worthless. After a year of no success, I am now also thinking about going to graduate school. I begun to research graduate courses and funding opportunities online. I asked for assistance from others with this but found it difficult to discuss my challenges and to then act on the advice they gave. Needless to say, it hasn't been easy.

Julia Williams

A few years before starting college, when I was 19, I was diagnosed with depression. However, I soon after started therapy and found it helpful for managing my depression. I am now 45, married and have two young children. I have also been an elementary school teacher for the past 20 years since receiving my college degree in education.

Following the recent loss of my husband's job, my family and I moved from Toronto to the countryside. The countryside promises a more affordable lifestyle and better job opportunities for my husband who works in the leisure industry.

I began teaching at a local school soon after arriving and my husband meets potential employers on the outskirts of the local area often. Therefore, I am responsible for most household duties while actively seeking ways for the kids to adjust to this new lifestyle and integrate into our new community. However, the transition has not been easy for the family and I feel responsible for their difficulties adjusting.

I have been experiencing recurring health issues that forces me to take leave from work and also doing some of my chores at home. My doctor believes these issues are primarily linked to mental factors and that my depression is resurfacing. I told him about my difficulties managing my emotions and being overly preoccupied with my problems instead of finding solutions. My husband is supportive but he's often really not sure how to best lend support. Due to a lack of treatment options in my area, my doctor thinks I should consider Web-based options like online therapy and participating in online mental health communities.

The Web has been instrumental for me living in the city and it has become even more helpful since the move. I could research local activities for the kids, purchase necessities at cheaper prices online, manage the family's banking and financial obligations, and find resources for my classes. While doing these things online are usually easier, I've been struggling to make much effort to do the simplest of tasks recently. It's just been a difficult time.

Conny Armstrong

I was always a worrier. I would worry about my family and friends, health, schoolwork, everything from a young age. When worried, I often felt tense, my stomach would churn and I sometimes even broke out in a sweat and had palpitations. It didn't take much to scare me either and was almost always irritable.

Now at age 35 and a single mother of one, there is much more to worry about. My daughter will start primary school this year, I recently got a big promotion, and I'm afraid I will regret not making enough time for my daughter or myself. Therapy has been somewhat helpful over the years but I hardly have time for that nowadays, especially given my demanding job.

I'm a Web analytics manager at an agency in Boston. A great deal of my work focuses on analyzing customer online behavior on various types of websites. This insight is crucial for advising our clients on how successful their campaigns are and what can be done to make improvements.

I absolutely love my job and have worked hard for this promotion. However, I now worry a lot about how I am going to cope with this added responsibility. Sure it comes as no surprise that I'm losing much sleep thinking about it all and this in turn makes it all worse as well. I've been considering the idea of working remotely from home a couple days a week so I could be there when my daughter is home from school. Managing projects and the team remotely has its disadvantages though. My work though heavily Web-based is very hands-on and calls for much discussion at times. We would need to rely more on our online collaborative tools.

Adrian Eriksen

I recently moved to Grenada to work on an architectural project for 6 months. I've been struggling to get sleep at night since I arrived. I just lay there and a million thoughts bombard my mind for hours. On the flip side, I've also been regularly having trouble concentrating at work during the day. My mind often just goes completely blank. Reading a book or doing research online can be very difficult.

There are also those times recently I felt dizzy and my fingers went numb or got tingly. It all seems so unreal at times, especially when I feel like I can't breathe. I guess it's all due to my anxiety re-emerging as I recognize some experiences from having such problems in the past. However, some of these symptoms are new and scary to me. Before it was mostly a case where I always imagined situations being much worse than they were in reality. When I had a headache, I would think it is a

tumor. Now I guess it's much more physical, random and unfortunately visible to others.

I've been mentally preoccupied and worrying about my family since arriving in Grenada. It was difficult leaving my pregnant wife at home in Denmark with our 12-year-old son but we often Skype and I do as much of my usual household duties as possible online. I generally try to make sure there isn't much disruption to their daily routine because I'm not there.

My son and I enjoy playing chess together so we still do this but online. I read and give him tips for his essays using online tools like Google docs and upload photos of my work here as he's interested in this as well. My wife is scheduled to give birth shortly after I return and we are getting everything ready for when our new-born girl arrives. We often send each other links to products we want to buy for the baby and also other stuff we need for the home generally. I sometimes also surprise her with seasonal flowers and am still able to order these online. I continue to pay bills, do our banking online, and order pet food and other household essentials online as normal.

Survey questions

- **What potential difficulties do you foresee [Persona] having [PERCEIVING/UNDERSTANDING/OPERATING] Websites?** Consider what it must be like to experience a particular symptom and how that can impact your ability to do the things you want to do online. It may also help thinking about [Persona] using websites that you use. Be sure to make reference to the general and or specific aspects of websites that you foresee being difficult for [Persona]. You can also include links to examples of these aspects.
- **Why do you think [Persona] may encounter those difficulties?** Kindly attempt to address each difficulty and be as detailed as possible.

Scientific Contributions

Peer Reviewed Publications

Bernard, R., Sabariego, C., & Cieza, A. (2019). *Difficulties encountered by people with depression and anxiety on the Web: Results from a qualitative study and online expert survey*. Journal of Medical Internet Research, Accepted for publication.

Kamenov, K., Ayuso-Mateos, J.L., Nieto, M., **Bernard, R.**, Hegerl, U., & Cabello, M. (2016). *Research recommendations for improving measurement of treatment effectiveness in depression*. Frontiers in Psychology, 3(356).

Bernard, R., Sabariego, C., & Cieza, A. (2016). *Barriers and facilitation measures related to people with mental disorders when using the web: A systematic review*. Journal of Medical Internet Research, 18(6).

Bernard, R., Sabariego, C., Baldwin, D. S., Abou-Zahra, S., & Cieza, A. (2015). *Web accessibility for persons with mental disorders: A protocol*. Human-Computer Interaction: Users and Contexts. M. Kurosu, Springer Int'l Publishing. 9171: 25-34.

Conference Contributions

Bernard, R. (2016, September). *Difficulties people with mental health conditions experience on the Web: Preliminary results from an expert survey and interviews with those affected*. Presentation at the 4th MARATONE Conference, Madrid, Spain.

Bernard, R. (2016, April). *Difficulties people with mental health conditions experience on the Web: Results from a systematic review*. Presentation at the 3rd MARATONE Conference, Oulu, Finland.

Bernard, R. (2015, August). *Web accessibility for persons with mental disorders*. Paper presented at the 17th International Conference on Human-Computer Interaction, LA, USA.

Bernard, R. (2015, March). *Web accessibility for people with mental health conditions: An overview*. Presentation at the 2nd MARATONE Conference, Munich, Germany.

Bernard, R. (2012, March). *Cyborg experiments: How they live, work and play*. Presentation at the Barbados Technology in Education Conference, Bridgetown, Barbados.

Bernard, R. (2012, March). *The future of the Web in education*. Presentation at the Barbados Technology in Education Conference, Bridgetown, Barbados.

Bernard, R. (2010, April). *Social media and human resource management*. Presentation at the 13th Annual Human Resource Management Association of Barbados Conference, Bridgetown, Barbados.

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