# BETTER-Project: Web Accessibility for Persons with Mental Disorders

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**Abstract.** The paper outlines a methodology proposed to give impetus to a collaborative effort involving integral stakeholders to determine whether Web accessibility facilitation measures must be adapted for people with depression and anxiety, and if so, in what way(s). The methodology has three-phases: (1) identification of Web accessibility barriers using two data sources: a systematic review of pertinent literature and focus group interviews with people with depression and anxiety; (2) validation of current Web accessibility facilitation measures for this population using experimental user-testing; (3) provision of expertise-based recommendations for the improvement of Web accessibility facilitation measures using a delphi method. If adopted, the study's findings are expected to herald improvements in the Web browsing experiences of people with depression and anxiety, and also everyone else who use the Web.

**Keywords:** Protocol · Web accessibility · Depression · Anxiety · Mental disorders

## 1 Introduction

The Web is an essential tool for participation within knowledge-based societies where timely and easy access to information is crucial for individual progress [1]. It is an important means by which people can gather information and learn about personally meaningful topics to make informed life choices like how best to manage one's health, what career one should pursue or even where one should live [2]. The Web is also a useful and convenient way to develop and maintain relationships with people in one's life such as life-partners, friends, family members and acquaintances among others

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[3, 4]. Additionally, it provides many opportunities to engage in recreational activities including online shopping, gaming, watching movies and listening to music [5, 6]. Understandably, those without reasonable access to the Web and its benefits are left at a disadvantage.

Facilitating access to the Web is not limited to providing the necessary technological infrastructure but also ensuring no access barriers exist that make it difficult to perceive, understand, navigate, and interact with Websites. For example, images, controls, and other structural elements on websites without equivalent text alternatives will present accessibility barriers for people with visual disabilities [7]. People with hearing impairments will experience great difficulty perceiving audio content – videos with voices and sounds – on the Web without captions or transcripts explaining what is being conveyed in media using sound [7]. It can also be especially challenging for persons with physical disabilities to use websites that do not provide full keyboard support [7].

Consequently, great effort has been put towards ensuring accessibility for those with disabilities, especially for people with sensory impairments and physical disabilities where research has been very fruitful. For instance, research surrounding accessibility for people with visual impairment focuses on conveying information via alternative sensory channels such as auditory (e.g., screen readers) and tactile means (e.g., refreshable Braille displays), along with more cutting edge efforts to develop virtual retinal displays and the customised pre-compensation of images to match the visual characteristics of individual users and produce undistorted retinal images [8]. Research into alternative input mechanisms for people with physical disabilities to gain access to systems used to navigate the Web has resulted in 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 [9].

People with mental disorders (PwMD) also face barriers when accessing the Web and some of these barriers may be unique to people with these disorders as well [10]. Good and Sambhanthan [11] reported several website elements that people with depression and anxiety identified as being accessibility issues: distracting design, confusing menu options, poor navigation, time limited response forms, information overload, non-perceivable icons, slow response in websites loading information, poor organisation and presentation complicated language, poor content filters, excessive advertisements, and complex purchasing processes. Ferron et al. [12] and Rotondi et al. [10] concluded that people with severe mental disorders require sites that explicitly state instructions for their use, feature a shallow hierarchy of pages, use clear and explicit labels, large navigational cues and pop-up menus to reduce clicking. Findings from Rotondi et al. [10] also reveal that these Web accessibility needs are distinct and are not covered by existing guidance and or Web-interface models.

However, improving accessibility for people with mental disorders has received little direct research attention [13]. A thorough keyword search of several databases (i.e., MEDLINE, PsycARTICLES, CINAHL, Library, Information Science and Technology Abstracts, Computers and Applied Sciences Complete, ACM Digital Library, SpringerLink, OpenGrey) for Web accessibility, mental disorders and related terms only returned 3 directly relevant results (i.e., [10–12] as discussed earlier).

It is important to identify and address the possible Web accessibility barriers people with mental disorders experience as such barriers may have a negative impact on how much they benefit from the Web due to the poor accessibility of the platform. Studies investigating several of the rapidly growing number of Web-based treatment methods including online mental health communities (e.g., [14, 15]), Web-based group therapy (e.g., [16, 17]) and self-directed therapy (e.g., [18, 19]) have presented promising results but there is also much room for improving Web-based interventions. Knowledge of how Web modifications can lead to improved access by this population will help create a more all-inclusive Web from which people with mental disorders can also benefit. The World Health Organisation reports that one in four people will be affected by a mental disorder in their lifetime [20]. This represents a very large segment of the world population that may be at a disadvantage due to barriers negatively impacting their Web usage.

A comprehensive understanding of the barriers people with mental disorders encounter on the Web is also essential for devising ways to effectively address accessibility for this population as well. The process of establishing Web accessibility facilitation measures, including standards and guidelines, should rely on evidence (e.g., research, expertise with relevant issues) about 'what' barriers exist and 'how' they could be addressed to later advise on what strategies should be employed to remove or reduce these barriers. This is why the BETTER (weB accEssibiliTy for people wiTh mEntal disoRders) project was initiated.

BETTER is a collaborative effort involving relevant stakeholders – people with mental disorders, practicing professionals in the field, regulators, policymakers and academia – to determine whether current Web accessibility facilitation measures must be adapted for people with mental disorders and if so, in what way(s). It focuses on depression and anxiety because they are the most common mental disorders [21] and account for the leading causes of disability-adjusted life years (DALYs) due to mental and substance use disorders worldwide (i.e., depressive disorders account for 40.5 % and anxiety disorders for 14.6 % of DALYs [22]). The general objective of this paper is to outline the methodology to be implemented by BETTER.

## 2 The Three Phases of the BETTER Project

### 2.1 Identification of Web Accessibility Barriers and Facilitation Measures (Phase I)

The objective of the first phase is to determine 'what' barriers people with depression and anxiety encounter when accessing the Web and 'how' those barriers can be removed or reduced. Two different methodologies will be utilised to meet this objective – a systematic review and qualitative study with people with depression and anxiety (Fig. 1).

**Study 1: Current Thinking on Digital Accessibility for PwMD.** The objective of this study is to identify evidence regarding accessibility barriers people with mental disorders (MD) experience when using digital technology and any corresponding facilitation measures used to address them. A systematic review of literature covering

| | Phase I<br>Identification of Web Accessibility Barriers and Facilitation Measures | Phase II<br>Evaluation of Web Accessibility Facilitation Measures | Phase III<br>Improvement of Web Accessibility Facilitation Measures |
|---|---|---|---|
| **Studies** | Current Thinking on Digital Accessibility for PwMD<br>*Systematic literature review* (Study 1)<br><br>Perspectives of people with depression and anxiety<br>*Semi-structured focus groups* (Study 2) | Validating Web Accessibility Facilitation Measures for People with Depression and Anxiety<br>*Usability-testing* (Study 3) | Developing Improvement Strategies<br>*Delphi Consensus* (Study 4) |
| **Expected Outcomes** | Summaries of (1) digital and specifically Web accessibility barriers persons with mental disorders face; (2) facilitation measures; (3) gaps in knowledge based on a comparison and integration of findings from study 1 and 2. | Detailed description of the effectiveness of Web accessibility facilitation measures and any identified shortcomings. | Set of recommended expertise-based Web accessibility facilitation measures for depression and anxiety. |

**Fig. 1.** Phases including studies and expected outcomes of the BETTER project.

the fields of psychology, medicine and computer science will be conducted using several databases: MEDLINE, PsycARTICLES, CINAHL, Library, Information Science and Technology Abstracts, Computers and Applied Sciences Complete, ACM Digital Library, SpringerLink, OpenGrey. A systematic review was chosen as it is especially useful for identifying, selecting, and critically evaluating relevant studies, and to collect and analyse data gathered from them [23].

Contrary to the focus in the other studies within the project, this review will not be limited to just depression and anxiety but will consider all mental disorders. This is to increase the likelihood that insight into the probable situation surrounding Web accessibility for people with depression and anxiety is gained and that the study does not suffer from the paucity of research in the area as revealed by preliminary searches. The scope of the review will also be expanded to include all digital technologies as this allows for many more opportunities to obtain relevant knowledge that a narrow focus on the Web alone will not provide.

Studies will be selected if they include participants with mental disorders, describe the difficulties that people with mental disorders encounter when using consumer information and communication technologies (ICT) or provide guidance on how to improve the accessibility of consumer ICTs for PwMD. Information about the ICTs studied, diagnoses and classifications used, barriers and corresponding facilitation measures, origin of facilitation measures, the research methodology followed and definitions for accessibility and disability will be extracted from studies where possible. A narrative synthesis [24] will then be performed to draw conclusions based on the data extracted from across the set of included studies.

**Study 2: Perspectives of People with Depression and Anxiety.** The objective of this study is to improve the understanding of persons with depression and anxiety's experiences using the Web from their perspective. Focus groups will be used to elicit details about participants' experiences. This method allows for a more rapid and productive way of obtaining accounts of Web usage from participants when compared to similar qualitative methodologies (e.g., ethnographic methods) [25]. It is also beneficial to participants as it gives them the opportunity to make connections with similar experiences during the group session [26].

Purposive sampling will be utilised to obtain participants for study. Participants must be: aged ≥ 18 (50 % < and ≥ 40); skilled Web users as indicated by the 10-item abbreviated Web-use skills indexes for populations with low levels of internet experiences [27]; diagnosed with depression and or anxiety as stipulated by the Diagnostic and Statistical Manual of Mental Disorders (DSM) 4/5th revision or International Classification of Diseases (ICD) 10th revision; without significant sensory or physical disabilities.

The topic guide will feature questions that provoke discussion about the difficulties participants experience when using the Web, the perceived determinants of the major difficulties experienced and ways these difficulties can be removed or reduced. Groups with young adult participants will allow the study to capture the perspective from more skilled and involved Web users [28]. Sessions with older participants (≥40) will also provide enlightening accounts about their unique experience which is known to be different from younger users' Web usage patterns [29].

Framework analysis as outlined by Ritchie and Spencer [30] will be utilised for this study. Findings in the form of emergent themes from focus group narratives will be organised around key questions posed in the topic guide [31]. A survey will be later conducted to validate these findings among a wider population of people with depression and anxiety.

**Expected Outcomes of Phase I.** Results from this phase will summarise (1) digital and specifically Web accessibility barriers persons with mental disorders face, (2) the strategies employed to overcome barriers and (3) identified gaps in knowledge about what barriers exist and how they could be addressed based on a comparison and integration of findings from study 1 and 2. The first and third outcomes will inform phase II by guiding the development of realistic and meaningful task scenarios for a usability testing study. Also, the second outcome will be used in phase II to determine the Web accessibility facilitation measures that are to be validated in the experimental study.

### 2.2 Evaluation of Web Accessibility Facilitation Measures (Phase II)

The objective of this phase is to validate all Web accessibility facilitation measures for persons with depression and anxiety identified in phase 1. It builds on phase I by testing the accessibility of websites that implemented current facilitation measures identified during that phase.

**Study 3: Validating Web Accessibility Facilitation Measures for Persons with Depression and Anxiety.** The objective of this study is to validate the effectiveness of facilitation measures identified in phase I that will result in the removal or reduction in Web accessibility barriers for persons with depression and anxiety. An experimental study including a control group will be used to fulfil this objective. This study design was chosen as it provides sound evidence for clear casual interpretations and delivers the strongest evidence on the effectiveness of facilitation measures [32].

Recruitment will obtain skilled Web users as indicated by the 10-item abbreviated Web-use skills indexes for populations with low levels of Internet experiences [27] who are without sensory or physical disabilities and are aged ≥ 18. The experimental group will include participants who meet criteria for a clinical diagnosis of major depression (depressive episode) and anxiety disorder as stipulated by the DSM-4/5 or ICD-10. Participants who have never been diagnosed with a mental disorder will be assigned to the control group.

Participants will complete usability testing exercises with selected webpages and be later questioned about their experience performing assigned tasks and if any, the major difficulties encountered. The webpages will be selected by a group of evaluators with similar training and years of experience that will assess a collection of webpages for their conformance to the Web accessibility facilitation measures identified in phase I. If any of these webpages do not have a high level of conformance, conforming webpages will be created for the final set of sites to be used in the study.

Results will demonstrate the effectiveness of existing facilitation measures for people with depression and anxiety. The effectiveness will be measured using the number of Web accessibility barriers and the subsequent frequency with which these barriers were encountered. Comparisons between participant groups and participants with either depression or anxiety will indicate any significant differences in their experiences. Findings will also provide critical information about how effective current facilitation measures are at removing or reducing accessibility barriers, if any changes are necessary and if so, where focus should be placed to realise improvements.

**Expected Outcomes of Phase II.** Phase II will detail the effectiveness of Web accessibility facilitation measures identified in phase 1. It will also provide information about barriers, if any, that persist despite the implementation of these facilitation measures. This understanding will help focus the subsequent phase on a specific set of Web accessibility barriers for people with depression and anxiety that remain after applying current facilitation measures as identified in phase 1.

### 2.3 Improvement of Web Accessibility Facilitation Measures (Phase III)

The objective of this phase is to work with the expertise of stakeholders to propose solutions that are likely to remove or reduce barriers that remain after the testing of Web accessibility facilitation measures for people with depression and anxiety done in phase II.

**Study 4: Developing Improvement Strategies.** The objective of this study is to develop expertise-based Web accessibility facilitation measures targeting the barriers for persons with depression and anxiety identified in phase II that remain after the implementation of facilitation measures revealed in phase 1. A delphi technique will be employed to achieve this objective. The technique is a well-established method for reaching consensus among subject experts about what could and should be done given a particular set of circumstances [33, 34]. The delphi method also facilitates an in-depth examination of practical issues in an anonymous environment that is not conducive to unfavourable group dynamics. For instance, respondents are freer from any pressure to express a certain perspective due to manipulation or coercion by a dominant participant [35].

Respondent selection will be mainly guided by Pill [36] and Ludwig [37] who are well-referenced researchers in delphi studies. Participants will be recruited based on their level of expertise by virtue of having over 3 years of practical experience working directly in Web accessibility.

They will be asked to offer facilitation measures that will remove or reduce the remaining barriers identified in phase II. These facilitation measures will target necessary changes at 3 levels: website authorship including design and content; design of systems, like browsers, that retrieve and render Web content; development of accessible tools that create accessible Web resources. General information about the acceptability of the recommended facilitation measures among the respondent group will be solicited using an open-ended questionnaire over several rounds until 80 % consensus is reached on which additional Web accessibility facilitation measures should be recommended for people with depression and anxiety.

**Expected Outcomes of Phase III.** Phase III will provide a set of expertise-based Web accessibility facilitation measures for persons with depression and anxiety targeting barriers that persist despite the implementation of Web accessibility facilitation measures identified in phase 1.

## 3 Practical Implications of Web Accessibility Facilitation Measures for People with Mental Disorders

BETTER, to our knowledge, is the first project involving all relevant stakeholders – people with mental disorders, practicing professionals in the field, regulators, policymakers and academia – to provide systematic documentation about the Web accessibility barriers people with depression and anxiety encounter, and how these barriers could be addressed. These findings will be shared with relevant stakeholders who can offer guidance to Web practitioners on how Web accessibility for people with depression and anxiety may be improved.

BETTER's findings will be of great value to several groups across society. People with depression and anxiety will chiefly benefit if insight from BETTER is implemented by Web managers. They will likely enjoy improved access to the Web which can enhance their participation in society and Web-based treatments as well. Governments, businesses and other organisations will be more informed about how they can better comply with article 9 of the Convention on the Rights of Persons with Disabilities with regards to accessibility on the Web and genuinely extend their reach to the large segments of the population with depression and anxiety. Depression, anxiety and other related interest groups will also be empowered to advocate for the adoption of BETTER's expertise-based Web accessibility facilitation measures when necessary.

It is anticipated that BETTER would also stimulate further Web accessibility mental disorder-specific research leading to a deeper understanding of people with mental disorders' accessibility needs when using the Web. Aspects of Web accessibility standards, education, implementation and policy can be updated to adequately accommodate the needs of people with depression and anxiety on the Web after consideration of BETTER's findings. Future research can also build on knowledge from BETTER's findings and confidently expand accessibility investigations into Web access from various devices (e.g., mobile, wearables) and into the realm of other digital technologies that are beneficial to people with depression, anxiety and other mental disorders.

Putting BETTER's recommendations into practice may likely herald improvements in the Web browsing experiences of not only people with depression and anxiety or other mental disorders but it is expected that the adoption of BETTER's findings would also result in improvements for everyone else who uses the Web.

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