

BRIDGE OR BARRIER: AN EXAMINATION OF THE ACCESSIBILITY OF ONTARIO
UNIVERSITY ACCESSIBILITY SERVICES OFFICES WEBPAGES

by

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ABSTRACT

Research examining the web accessibility of postsecondary institutions has primarily focused on the homepage of the website, with few examining Canadian institutions. This study explored how easy it is to locate the homepage of each Ontario University Accessibility Services Office and evaluated the compliance of each homepage with the most recent version of the Web Content Accessibility Guidelines (WCAG 2.1). Using qualitative methodology and an automated accessibility tool (Total Validator), 21 Ontario University Accessibility Services Offices homepages were analyzed. Each homepage was located, and all failed to comply with WCAG 2.1 standards. Across homepages, 100% had at least one WCAG 2.1 Level A error, and 71% had at least one WCAG Level AA error. The most common WCAG 2.1 error was improperly nesting headings. Implications and recommendations for Ontario University Accessibility Services Offices are discussed, along with considerations for future research.

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CHAPTER ONE

Introduction to the Problem

Over the past two decades, there has been a steady increase in the number of students with disabilities enrolled at postsecondary education institutions (Condra, 2015; Madaus et al., 2010; Madaus et al., 2018; Summers et al., 2014; Toutain, 2019). Between 2009-2010 and 2019-2020 Ontario postsecondary institutions saw a 132 percent increase in the number of registered students with disabilities (Government of Ontario, 2021b). This increase has led to a rise in the number of students needing disability-related accommodations in postsecondary education (Harrison et al., 2013). Despite accommodations being a legal right in Canada and the United States, research has found that many postsecondary students with disabilities lack knowledge and awareness of the services available to them (Lindsay et al., 2018; Toutain, 2019). Since university students typically access information using the internet (Nagel et al., 2020), it is important to evaluate the web accessibility of Accessibility Services Offices webpages. The goal of the present study is to determine whether the homepage of Ontario University Accessibility Services Offices act a barrier for students with disabilities.

Literature Review

Canadians with Disabilities

Prevalence

The Government of Canada uses the Canadian Survey on Disability (CSD) to gather information about Canadians aged 15 and over who experience daily limitations due to long-term conditions or health-related problems (Cloutier et al., 2018). The first CSD was conducted in 2012 and is to be updated every five years (Cloutier et al., 2018). The CSD uses the social model of disability, which conceptualizes a disability as the result of the interaction between an

s functional impairments and barriers in their environment (Cloutier et al., 2018). The impairments but instead by an environment that does not consider them (Mackenzie et al., 2009). In keeping with this model, the CSD uses which also uses the social model of disability, to identify persons eligible to complete the survey (Cloutier et al., 2018; Morris et al., 2018).

The most recent CSD, conducted in 2017, found that one in five Canadians aged 15 years and older have one or more disabilities (Morris et al., 2018). Of the 6,246,640 Canadians identified as having one or more disabilities, 1,295,660 were classified as having a severe disability, and 1,383,630 were classified as having a very severe disability. Severity was based on three factors: number of disability types, level of difficulty experienced performing tasks, and frequency of activity limitations. Pain-related, flexibility, and mobility-related disabilities were most common among individuals 65 and over. Mental health-related and learning disabilities were most common among youth, with 77% of youth reporting a mental health related and/or learning disability. Additionally, almost half of youth reported multiple disability types, with 40.5% reporting having two or three and 19% reporting having four or more (Morris et al., 2018).

Federal Accessibility Standards

The Government of Canada acknowledges that persons with disabilities have a right to fully participate in society without barriers. The rights of persons with disabilities were first recognized in the Canadian Human Rights Act which came into effect in 1977 to protect Canadians against all forms of harassment and discrimination (Government of Canada, 2018b). Since disability is a prohibited ground of discrimination, employers and service providers have

what is known as a duty to accommodate (Government of Canada, 2019). The duty to accommodate acknowledges that sometimes individuals require support to fully participate in society (Canadian Human Rights Commission, 2021). For example, an employee who has a visual impairment has a right to be provided with an adapted computer screen and software to access their job (Canadian Human Rights Commission, 2021). Similar to the Canadian Human Rights Act, the Charter of Rights and Freedoms, which came into effect in 1982, paved the way for positive change for the rights of individuals with disabilities (Government of Canada, 2020a). Specifically, Section 15 of the Charter affirms that all individuals should have equal rights and protections (Government of Canada, 2020a). Section 15 protects individuals who experience social, political, and legal disadvantages in society, including persons with physical or mental disability (Government of Canada, 2020a).

The Government of Canada has also taken action to make the Web more accessible (Government of Canada, 2011a). In 2000, the government developed its first set of web accessibility standards referred to as Common Look and Feel 1.0 (CLF 1.0). The CLF 1.0 standards required all government websites and web applications to comply with the internationally accepted Web Content Accessibility Guidelines 1.0 (WCAG 1.0) by the end of 2002 (Government of Canada, 2011a).

In January of 2007, CLF 2.0 came into effect (Government of Canada, 2011a). Similar to CLF 1.0, this new standard applied to all new government websites and web applications and allowed departments two years to comply. Recognizing the new WCAG 2.0 standards, in January of 2010, the Secretary of the Treasury Board replaced CLF 2.0 with three new standards: the *Standard on Web Accessibility*, the *Standard on Web Usability*, and the *Standard on Web Interoperability*. Today, the Standard on Web Accessibility requires all Government of Canada

websites and web applications to meet all five WCAG 2.0 conformance requirements

The Accessible Canada Act defines a disability as any impairment that, in interaction with a barrier, prevents an individual from fully participating in society (Government of Canada, 2020b). The impairment may be physical, mental, intellectual, cognitive, learning, communication, or sensory and can be permanent, temporary, or episodic (Government of Canada, 2020b). These broad definitions allow for the inclusion of all persons with disabilities who experience various limitations (Government of Canada, 2020b). The primary goal of the Act is to make Canada barrier-free by January 1, 2040, through the identification, removal, and prevention of barriers (Government of Canada, 2020b). The first set of regulations came into effect in December of 2021 (Government of Canada, 2022) and all federal jurisdictions are required to comply (Government of Canada, 2020b).

Although the federal government has adopted accessibility standards, few provinces have followed suit. To date, Ontario, Manitoba, and Nova Scotia are the only provinces that have enacted accessibility standards, with Ontario being the first (Thomson, 2020). Ontario released their standards in 2005 (Government of Ontario, 2015), with Manitoba following in 2013 (Manitoba Government, n.d.) and Nova Scotia in 2017 (Government of Nova Scotia, 2021).

Ontario Accessibility Standards

In 1962, the Ontario Human Rights Code came into effect (Ontario Human Rights Commission, n.d.-c). Similar to the Canadian Human Rights Act and Charter of Rights and Freedoms, the Code protects individuals from all forms of discrimination and harassment (Ontario Human Rights Commission, n.d.-c). The goal of the Code is to create an environment without discrimination that instead fosters respect and understanding for all people (Ontario Human Rights Commission, 2013). The Code states that all employers, unions, housing providers, and services providers have a duty to accommodate persons with disabilities (Ontario

Human Rights Commission, n.d.-a). The goal of accommodations is to ensure equal access and opportunity. The principles guiding accommodations in Ontario include respect for dignity, individualization, and integration and full participation (Ontario Human Rights Commission, n.d.-a).

Ontario aims to create an accessible and inclusive province by 2025 and was the first province to establish goals and a timeline for completion (Government of Ontario, 2015). Similar to the Accessible Canada Act, Ontario has the Accessibility for Ontarians with Disabilities Act, also known as AODA (Government of Ontario, 2015). The purpose of the act is to develop, implement, and enforce standards to increase accessibility for Ontarians with disabilities. Currently, there are five AODA standards that represent different areas of daily life (Government of Ontario, 2015). The *Customer Service Standard* aims to remove barriers that prevent persons with disabilities from being able to access goods, services, or facilities. The *Design of Public Spaces Standard* helps individuals and organizations make outdoor public areas more accessible for persons with disabilities. The *Transportations Standard* aims to help make it easier for persons with disabilities to travel within the province. The *Employment Standard* targets hiring, and employee supports and aims to make these practices more accessible for persons with disabilities. Finally, the *Informed Communications Standard*, assists individuals and organizations in making their information more accessible to persons with disabilities (Government of Ontario, 2015).

To ensure information is accessible in online spaces, all public sector organizations and private or non-profit organizations with 50 or more employees are required to make new and significantly refreshed public websites accessible (Government of Ontario, 2021a). As of January 1, 2021, all public websites and web content posted after January 1, 2012, must meet

WCAG 2.0 Level AA conformance standards (more information about the organization of the WCAG, success criteria, and conformance can be found starting on page 16) with the exception of success criteria 1.2.4. (live captions) and 1.2.5. (pre-recorded audio descriptions).

Organizations are encouraged to use automatic assessment tools and user testing and feedback to evaluate compliance (Government of Ontario, 2021a). The Government of Ontario recognizes that it may not be possible to meet certain WCAG 2.0 criteria but reminds organizations that upon request they have a duty to remove the barriers and provide their web content in an accessible format (Government of Ontario, 2021a). However, despite protections, persons with disabilities continue to experience barriers.

Barriers Experienced by Persons with Disabilities

Barriers in Canada

Recognizing the prevalence and severity of disabilities, Statistics Canada developed a survey to investigate the types of barriers experienced by Canadians with disabilities (Statistics Canada, 2021). The Survey on Accessibility in Federal Sector Organizations (SAFSO) explored barriers persons with disabilities experience when interacting with areas under federal jurisdiction (Statistics Canada, 2021). To confirm disability status, participants must have participated in the 2017 CSD and were required to complete the Activities of Daily Living (ADL) questions to verify that they continue to experience difficulties (Statistics Canada, 2021).

The SAFSO found that 73% of Canadians with disabilities who interacted with federally regulated businesses and organizations experienced at least one type of barrier (McDiarmid, 2021). Among participants who identified barriers, 87.2% had hearing difficulties, 80.9% had vision difficulties, 80.6% had cognitive difficulties, 77.6% had mental health-related difficulties, 76.5% had physical difficulties, and 76.4% reported another type of health problem or long-term

condition (McDiarmid, 2021). The survey found that 62.5% reported barriers with transportation, 61.5% reported communication barriers, and 44.6% reported barriers with information and communication technologies (McDiarmid, 2021). In the area of information and communication technologies, the types of challenges experienced ranged from a lack of internet access to videos without captions and difficulties navigating a complex website (McDiarmid, 2021). The two most common information and communication technologies barriers found were related to self-serve technology and accessing federal government information, services, or supports online (Statistics Canada, 2021). Specifically, 19% of Canadians with disabilities, difficulties or long-term conditions experienced barriers when accessing federally governed websites (Statistics Canada, 2021). This means that 19% of Canadians with disabilities may experience barriers when trying to access online information about the disability benefits and services they are entitled to.

Barriers to the Web

Web accessibility barriers are not new. Today, most web related technologies are still created inaccessibly, which excludes many users with disabilities (Dobransky & Hargittai, 2016; Lazar & Jaegaer, 2011). Despite existing web accessibility guidelines, such as the Web Content Accessibility Guidelines (WCAG), many hardware and software developers do not take persons with disabilities into consideration when developing their products (Dobransky & Hargittai, 2016). As a result, many people with disabilities use the Internet less often (Lazar & Jaegaer, 2011) or must rely on assistive technologies, including specialized software and hardware, to access information (World Wide Web Consortium, 2022a). To help remove barriers, the World Wide Web Consortium identifies supports and assistive technologies that help people with different types of disabilities access information on the web (World Wide Web Consortium,

2022a). If the supports or assistive technologies, listed below by disability category, are not adopted, individuals can experience barriers to access.

Auditory Disabilities. Auditory disabilities include, but are not limited to, being hard of hearing, deafness, and deaf blindness (World Wide Web Consortium, 2022a). To access websites and web content, persons with auditory disabilities often rely on media players that produce transcripts and captions of audio content (World Wide Web Consortium, 2022a). Additionally, some individuals require the use of sign language to supplement the text (World Wide Web Consortium, 2022a). Many individuals also benefit from having the option to stop, pause, and adjust the volume of the audio content, as well as the option to adjust the text size and color of captions (World Wide Web Consortium, 2022a).

Cognitive, Learning, and Neurological Disabilities. Cognitive, learning, and neurological disabilities include, but are not limited to, attention deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD), intellectual disabilities, learning disabilities, mental health disabilities, memory impairments, multiple sclerosis, perceptual disabilities, and seizure disorders (World Wide Web Consortium, 2022a). To access websites and web content, persons with cognitive, learning, and neurological disorders often benefit from simpler text, images and other illustrations to supplement text, consistent labeling, clearly structured content, options to suppress flashing or flickering, and having different ways to navigate the website (World Wide Web Consortium, 2022a). Individuals may also benefit from the use of text-to-speech software when accessing web information and using captions to supplement audio/video information (World Wide Web Consortium, 2022a).

Physical Disabilities. Physical disabilities include, but are not limited to, amputation, arthritis, fibromyalgia, rheumatism, reduced dexterity, muscular dystrophy, repetitive stress

injury, tremor and spasms, and quadriplegia (World Wide Web Consortium, 2022a). Persons with physical disabilities often rely on a specially designed keyboard or mouse, hands-free interaction, and other aids to help with typing (World Wide Web Consortium, 2022a). Common barriers for persons with physical disabilities include complicated navigation mechanisms, controls that do not have text alternatives, having insufficient time allowed, websites that do not provide full keyboard support, and websites that lack navigational aids (World Wide Web Consortium, 2022a).

Speech Disabilities. Speech disabilities include, but are not limited to, apraxia of speech, cluttering, dysarthria, speech sound disorder, stuttering, and muteness (World Wide Web Consortium, 2022a). Persons with speech disabilities often rely on text-based methods of communication. Common barriers for persons with speech disabilities include all web-based services and applications that require voice only interaction and websites that only offer phone numbers as a way to communicate (World Wide Web Consortium, 2022a).

Visual Disabilities. Visual disabilities include, but are not limited to, color blindness, low vision, blindness, and deaf blindness (World Wide Web Consortium, 2022a). Persons with visual disabilities often benefit from using text-to-speech, listening to audio descriptions, enlarging or reducing text size, reading text using refreshable Braille hardware, and customizing fonts, colors, and spacing of text (World Wide Web Consortium, 2022a). Common barriers for persons with visual disabilities include lack of text alternatives, text or page layouts that cannot be resized, complicated navigation mechanisms, text and images with insufficient contrast, and websites that do not provide full keyboard support or do not support custom color combinations (World Wide Web Consortium, 2022a).

Barriers to Assistive Technologies

Persons with disabilities often use assistive technologies to access the Web, as noted above (World Wide Web Consortium, 2022a). Unfortunately, many individuals experience difficulties using or accessing assistive technology. The W3C found that many assistive installing software (World Wide Web Consortium, 2022a).

Barriers to Employment

Persons with disabilities continue to face significant employment challenges (Lazar & Jaeger, 2011) and are often viewed as less capable or skilled (Foster & Wass, 2012; Jammaers et al., 2016). Employment opportunities have also been found to be limited for persons with disabilities, especially those with severe disabilities (Morwane et al., 2021). The most recent CSD found that Canadians without disabilities had higher rates of employment than those with disabilities (Morris et al., 2018). Specifically, 80% of persons without disabilities were employed compared to 59% of persons with disabilities (Morris et al., 2018). Despite human rights protections, persons with disabilities continue to experience discrimination in the labour market (Shier et al., 2009). Globally, the World Health Organization found similar rates of employment (World Health Organization, 2011). Across 27 countries only 44% of working-age persons with disabilities were employed compared to 75% of working-age persons without disabilities (World Health Organization, 2011). As a result, persons with disabilities experience higher rates of poverty (Mitra et al., 2013; World Health Organization, 2011) and often obtain lower paying jobs with limited opportunity for advancement (Gunderson & Lee, 2015; Maroto & Pettinicchio, 2014; Schur et al., 2009). Common barriers to employment found in the literature include negative attitudes from employers, discrimination, lack of education, lack of transportation,

limited health services, lack of support networks, and poor self-esteem (Mitra et al., 2013; Morwane et al., 2021; Shier et al., 2009; World Health Organization, 2011). Abidi and Sharma (2014) highlight that education, in particular, is essential for obtaining employment.

Barriers in Education

To gain an understanding of the barriers Canadians with disabilities face in schools, the Canadian Human Rights Commission analyzed data from the 2012 Canadian Survey on Disability and gathered information from consultations with expert organizations (Canadian Human Rights Commission, 2017). In 2017, the commission identified four main barriers: lack of disability accommodation and support, lack of services and funding, ineffective dispute resolution, and lack of special education and disability supports on First Nations reserves. At all levels of education, Canadians with disabilities experienced significant barriers accessing accommodations (Canadian Human Rights Commission, 2017).

Challenges accessing accommodations and support services is a common theme in the literature. Newman and Madaus (2014) sought to determine whether access to accommodation varied between high school to postsecondary education. Using data from the U.S National Longitudinal Transition Study-2, the researchers found that in high school, 95% of students received accommodations. However, in postsecondary education, the study showed a substantial decline with only 23% of students receiving accommodations. Interestingly, in postsecondary education, 50% of students did not believe that had a disability, and only 35% chose to disclose their disability to Accessibility Services Offices (Newman & Madaus, 2014). Newman and Madaus (2014) suggest that this may be due to students not feeling the implications of their disability, not understanding the nature of their disability, not being aware of why they received accommodations and supports in high school, lacking self-advocacy skills, or not being aware of

the legal rights differences between high school and postsecondary. Their suggestions align with previous studies which have shown that students lack an understanding of their legal right to accommodations, are not prepared to disclose their disability, are not aware that their conditions are considered disabilities, and are not knowledgeable of how to access services and accommodations available to them (Getzel, 2008; Kent et al., 2018; Lightner et al., 2012; Lindsay et al., 2018; Pierre, 2016, Marshak et al., 2010, Mambolea et al., 2020; Mullins and Preyde, 2013; Newman & Madaus, 2014; Thompson-Ebanks and Jarman, 2017).

Even when students disclose their disability and register with Accessibility Services Offices, research has found that they are often met with resistance from professors who do not want to implement their accommodations or understand their functional impairment or needs (Marshak et al., 2010; Pierre, 2016). Additional barriers to accessing accommodations include self-stigma, fear of disclosure due to stigma, a desire to avoid negative social reactions, lack of self-awareness, concerns about the accommodations meeting their needs, concerns over the quality of the services, and discrimination (Hartrey et al., 2017; Hong, 2015; Kent et al., 2018; Marshak et al., 2010; Mambolea et al., 2020; Pierre, 2016; Ostrowski, 2016). Many students also report that the process of obtaining accommodations acts as a barrier (Mullins & Preyde, 2013). Specifically, students report that the process is time consuming, triggering, bureaucratic, and intimidating (Pierre, 2016).

Accessing Accommodations in Postsecondary Education

Proper and effective accommodations are integral to the success of postsecondary students with disabilities (Gin et al., 2021). A lack of access to accommodations puts students with disabilities at risk of not completing their postsecondary degree and living in poverty (Lindsay et al., 2018). Fortunately, offices for students with disabilities are designed to help

encourage students with disabilities to disclose their disability, request accommodations, and develop self-advocacy skills (Lindsay et al., 2018).

Process of Registering with Accessibility Services Offices

Graduating from high school and entering postsecondary education is a critical transition between secondary and postsecondary education settings, students with disabilities must also navigate policy differences relating to accessing supports (Parsons et al., 2020).

Registering in Ontario. In Ontario, the Education Act governs elementary and secondary education, whereas postsecondary education is governed by the Ontario Human Rights Code (Parsons et al., 2020). Elementary and secondary school staff are often responsible for actively seeking out students with difficulties and/or disabilities and implementing appropriate supports (Lovett et al., 2014). In elementary and secondary education, students who meet school board criteria can be identified as an *exceptional student* (Ontario Ministry of Education, n.d.). Areas of exceptionalities include behavioural, communicational, physical, intellectual, and multiple. It is the identification as an exceptional student that provides students with access to specific special education programming and/or services and leads to the development of an Individual Education Plan which may include accommodations, modifications, and alternative curriculum expectations. It is important to note that school boards in Ontario also have the discretion to develop Individual Education Plans for students they believe need or would benefit from additional supports but do not meet criteria to be identified as an exceptional student. This means that students may receive accommodations or special education programs and services without meeting exceptionality criteria or having a diagnosed disability.

Students who received accommodations in elementary or high school but do not have a formal diagnosis are no longer able to access these same supports in postsecondary education settings, as postsecondary institutions require formal documentation from a qualified health care professional outlining the diagnosis and functional limitations that necessitate the supports (Parsons et al., 2020). Students with learning disabilities are often required to provide a recent (conducted within the last three to five years) psychoeducational assessment , meaning that if a delayed (Transition Resource Guide, n.d.). Financial barriers may also prevent individuals from being able to receive an updated psychoeducational assessment and therefore prevent them from accessing needed supports.

To access services in postsecondary education, students are responsible for Accessibility Services Offices (Getzel, 2008). Ideally, students should start the registration process with Accessibility Services Offices prior to arriving on campus to avoid any delays (Gil, 2007; Lightner et al., 2012). Gil (2007) outlines the typical process for obtaining accommodations. First, students need to be familiar with the documentation requirements. Students can obtain information about documentation requirements

Accessibility Services Offices webpage or by contacting the office directly. As a part of the process, many universities in Ontario require students to complete an online intake form. To access this form, students must login using their university identification, which they receive upon acceptance into their program. At the intake meeting, students usually learn about the accommodations they are eligible for and are made aware of their responsibilities in the accommodation process.

Registering in the United States. To access accommodations in postsecondary institutions, students must first submit a request for accommodation (Miller et al., 2019). Students then complete an intake assessment with a member from their disability support services (DSS) office and are required to provide a written report which outlines the functional limitations of their disability (Miller et al., 2019). To allow for a smooth transition of supports, students are encouraged to become familiar with their institution's guidelines to ensure they have the necessary documentation ahead of time (Miller et al., 2019). Once DSS has approved the request, another meeting is scheduled to discuss potential accommodation plans. (Miller et al., 2019).

It is clear that both in Ontario and the United States, Accessibility Services Offices and/or DSS offices rely on the web for many aspects of their services. At many institutions, Accessibility Services Offices require students to complete an online application, request accommodations through an online link, or submit disability documentation online. Therefore, it is important to explore whether the online requirements are accessible or are they acting as a barrier for students when they are trying to access information or register with an Accessibility Services Offices.

Web Accessibility

Web Accessibility Guidelines

To make the web more accessible, the World Wide Web Consortium (W3C) developed the Web Content Accessibility Guidelines (WCAG), which are now an internationally accepted standard on web accessibility (World Wide Web Consortium, 2018). The first version, WCAG 1.0, was released in May of 1999 (World Wide Web Consortium, n.d.-f). The primary goal of WCAG 1.0 was to promote accessibility and provide solutions to fix accessibility problems

(Campoverde-Molina et al., 2021; World Wide Web Consortium, n.d.-j). Building upon WCAG 1.0, in December of 2008, the second version, WCAG 2.0, was released (World Wide Web Consortium, 2018). The WCAG 2.0 ensured that requirements could be applied across technologies and identified who benefited from the standards, helping to promote the importance of accessible content (World Wide Web Consortium, n.d.-e).

In June of 2018, the third version, WCAG 2.1, was released (World Wide Web Consortium, 2018). The WCAG 2.1 standards build upon the previous WCAG 2.0 requirements, meaning that if an organization meets the new WCAG 2.1 standards, they also conform to the previous WCAG 2.0 requirements (World Wide Web Consortium, 2018). The main difference between the WCAG 2.0 version and WCAG 2.1 version is the addition of 17 new success criteria, which aim to increase mobile accessibility and support users with low vision and cognitive and learning disabilities (World Wide Web Consortium, 2020). The WCAG 2.1 also include fictional stories and examples to help individuals and organizations understand the real-world implications of the criteria (World Wide Web Consortium, 2020). For example, the new success criterion 1.4.12 relates to text spacing (World Wide Web Consortium, 2020). The

tired, I also increase the spa

Guideline 1.4). For this individual, text spacing allows them to access web information in way that met their needs (World Wide Web Consortium, 2020).

The fourth version, WCAG 2.2, is set to be published in September of 2022 (World Wide Web Consortium, 2022b). Although many formal web accessibility policies and standards

require WCAG 2.0 conformance, the W3C encourages individuals and organizations to confirm to the most recent version, WCAG 2.1 (World Wide Web Consortium, 2018). The WCAG 2.1 is made up of four principles, 13 guidelines that help address each principle, and 78 success criteria that outline what must be achieved to conform to the standards (see Table 1 for a descriptions). The principles and guidelines help categorize the success criteria but are not the focus. It is the success criteria, which are written statements that are either true or false, which allow organizations to directly test their conformance to the standards (World Wide Web Consortium, n.d.-e). There are three levels of conformance that are associated with each success criteria (see Table 2 for descriptions). The W3C recommends Level AA compliance, which means organizations must satisfy all Level A and Level AA criteria. To achieve what is considered the gold standard, Level AAA, organizations must satisfy all criteria (World Wide Web Consortium, 2018).

Web Accessibility and Education

To date, there is a very limited literature that examines the accessibility of Accessibility Services Offices websites. The goal of university Accessibility Services Offices are to remove barriers (Ontario Human Rights Commission, n.d., -b). However, many students lack knowledge of available accommodations (L13(s) cr.1r0 G[3f a, 2018).

CHAPTER TWO

Bridge or Barrier: An Examination of the Accessibility of Ontario University Accessibility

Services Offices Webpages

Access to education is a human right (United Nations, n.d.) and a strong predictor of long-term health and quality of life (Shankar et al., 2013). Research shows that higher levels of education lead to better socioeconomic positions, increase rates of re-employment success, literacy (Raphael et al., 2020; Riddell & Song, 2011). Additionally, a growing body of literature has found that education enhances subjective well-being, increases independence, leads to better decision-making, and encourages civic participation (Oreopoulos & Salvanes, 2011; Tomaszewski et al., 2019). The effects of education on health outcomes are well documented and support the need for equitable access to education, especially for persons with disabilities who are at an increased risk of poorer health outcomes (Emerson & Baines, 2011).

Canadian Laws Protecting Persons with Disabilities

In Canada, persons with disabilities are protected by both federal and provincial or territorial laws (Government of Canada, 2022). The main statutes that protect the rights of persons with disabilities include the Canadian Human Rights Act (Government of Canada 2018b), the Canadian Charter of Rights and Freedoms (Government of Canada, 2020b), the United Nations (UN) Convention on the Rights of Persons with Disabilities (Government of Canada 2018b), the Accessible Canada Act (Government of Canada, 2020b), and provincial human rights laws (Government of Canada, 2018a). It is the Charter of Rights and Freedoms, specifically section 15, that guarantees the equality of rights and provides a legal basis for proving discrimination (Zap & Montgomerie, 2013). Currently, only Ontario, Manitoba, and

Nova Scotia have provincial accessibility acts (Thomson, 2020). Ontario was the first province to establish an accessibility act and is one of the only provinces that has set a goal and timeframe for becoming a more accessible province (Government of Ontario, 2015).

Inclusive Postsecondary Education in Ontario

In compliance with human rights laws, postsecondary institutions in Ontario have developed policies and specialized facilities and/or academic support units, such as Accessibility Services Offices, to provide services and support to students with disabilities (Ontario Human Rights Commission, n.d.-b). Postsecondary Institutions have what is referred to as a duty to accommodate (Ontario Human Rights Commission, n.d.-a). This means that postsecondary institutions are legally responsible for providing students with disabilities with accommodations to ensure equal access and opportunity (Ontario Human Rights Commission, n.d.-a).

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Accessibility Services Offices (Getzel, 2008). Ideally, students should start the registration process with Accessibility Services Offices prior to arriving on campus to avoid any delays (Gil, 2007). Gil (2007) outlines the typical process for obtaining accommodations. First, students need to be familiar with the documentation requirements which they can obtain through the

Accessibility Services Offices webpage or by contacting the office directly. As a part of the process, many universities in Ontario also require students to complete an online intake form. To access this form, students must login using their university identification, which they receive upon acceptance into their program. The process of scheduling a meeting with someone from Accessibility Services Offices can vary across institutions, and some require students to request the appointment online using their university identification. At the intake

meeting, students usually learn about the accommodations for which they are eligible and are made aware of their responsibilities in the accommodation process.

Ironically, the accommodation process, which aims to remove barriers, has been found to create additional challenges for persons with disabilities in postsecondary education (Ontario Human Rights Commission, n.d.-b). In examining the experiences of students with disabilities, Getzel (2008) found that many postsecondary students choose not to disclose their disability, are unprepared to disclose their disability, or are aware of how to access services. Similarly, Lindsay et al., (2018) found that students lack knowledge of available accommodations at the postsecondary level and are often unaware of the individualized supports they received in high school. Newman and Madaus (2014) explored the transition in supports from high school to postsecondary education and found that a majority of students received accommodations in high school but only a small minority received them during their postsecondary studies. The results of these studies are concerning, as research has found that a lack of access to accommodations and supports puts students with disabilities at risk of not completing their postsecondary degree and living in poverty (Lindsay et al., 2018). From a legal perspective, institutions could be at risk of legal repercussions if their services are not fully accessible (Zap & Montgomerie, 2013).

To date, there is a very limited literature that examines the accessibility of Accessibility Services Offices. It is known that many students with disabilities lack knowledge of available accommodations (Lindsay et al., 2018). A major risk factor for students with disabilities trying to complete their education and enter the workforce is inaccessible resources, information, and services (Zap & Montgomerie, 2013). To our knowledge, no published study has explored the types of barriers students with disabilities experience when trying to locate and understand information on the Accessibility Services Office webpage. With the internet being

a primary source of information for both persons with and without disabilities (Zap & Montgomerie, 2013), the web accessibility of these services must be explored.

What is Web Accessibility?

Issues of web accessibility are not new. Just like education, access to the web is a protected human right under the UN Convention of the Rights of Persons with Disabilities (World Wide Web Consortium, 2021). In 1999, the World Wide Web Consortium (W3C), a leader in web accessibility and a primary source for guidelines, released its first set of internationally recognized web accessibility standards called the Web Content Accessibility Guidelines version 1.0 (World Wide Web Consortium, 2018). The WCAG 1.0 set three levels of priority for web accessibility (Zap & Montgomerie, 2013). In 2008, the Web Content Accessibility Guidelines version 2.0 were released (World Wide Web Consortium, 2018). The WCAG 2.0 builds upon version 1.0 and established more testable criteria to measure conformance (Zap & Montgomerie, 2013). More recently, in 2018, the W3C released the Web Content Accessibility Guidelines version 2.1 (World Wide Web Consortium, 2018). Again, building upon previous versions, the WCAG 2.1 includes 17 new criteria and fictional stories that highlight the real-world implications of these standards (World Wide Web Consortium, 2018).

The WCAG 2.1 has four guiding principles: (1) perceivable; (2) operable; (3) understandable; and (4) robust (World Wide Web Consortium, 2018). Each principle has a set of guidelines with related testable success criteria (World Wide Web Consortium, 2018). It is the success criteria, which are written statements that are either true or false, that allow organizations to test their level of conformance (World Wide Web Consortium, n.d.-e). For example, Principle 1 (i.e., perceivable) has four associated guidelines that help make webpages easier for individuals

to view (World Wide Web Consortium, 2018). An example of a guideline associated with Principle 1 is Guideline 1.1, which explains that a webpage must provide text alternatives for non-text content (World Wide Web Consortium, 2018). The success criterion related to this guideline is Success Criterion 1.1.1 Non-text Content (a description of this success criterion can be found on Table 6). Each success criterion is given a level of conformance that ranges from Level A (lowest) to Level AAA (highest). To conform to WCAG 2.1 Level A standards, an organization must comply with all Level A Success Criteria. To conform to WCAG 2.1 Level AA standards, an organization must comply with all Level A and Level AA Success Criteria. To conform to WCAG 2.1 Level AAA standards, an organization must comply with all Level A, Level AA, and Level AAA Success Criteria. The levels of conformance give organization a better estimate of their web accessibility (World Wide Web Consortium, 2018).

Web Accessibility in Canada

To ensure equity in online spaces, the Government of Canada developed federal web accessibility standards. While persons with disabilities receive protection under existing legislations, these standards help ensure people with disabilities can perceive, understand, navigate, and interact with websites and web applications (World Wide Web Consortium, 2021). Federally, all Government of Canada websites and web applications are required to conform to WCAG 2.0 Level AA standards (Government of Canada, 2011a). Provincially, web accessibility legislation varies. Again, as a leader in accessibility legislation, the province of Ontario was the first to develop their own standard on web accessibility (Government of Ontario, 2021a).

As of January 1, 2021, the webpages of all Ontario public sector organizations and private or non-profit organizations with at least 50 employees must comply with WCAG 2.0 Level AA standards (Government of Ontario, 2021a). Failure to meet this deadline and comply

with the standards can result in fines upwards of \$50,000-\$100,000 per day (Carleton University, 2021). With Ontario being the largest province in Canada, supporting the greatest number of persons with disabilities (Statistics Canada, 2015), it is essential that web accessibility standards be upheld and enforced across organizations. Historically, policies that are not backed by laws are often not followed (Zap & Montgomerie, 2013). Zap and Montgomerie (2013) draw attention to a 2006 legal case which involved an individual suing the Government of Canada for discrimination based on Section 15 of the Charter for failure to make a job application webpage accessible. The judge sided with the plaintiff and the Government of Canada was given 15 months to update all Government websites making them accessible to visually impaired persons. The case, *Donna Jodhan v. Attorney General of Canada*, set a precedent of web inaccessibility being recognized as a charter violation. Zap and Montgomerie (2013) further note that this sort of precedent could result in a shift to more compliance with web accessibility guidelines by companies in Canada.

Evaluating Web Accessibility

Automated tools, user testing, and expert testing are all methods used to assess web accessibility (Oud, 2012). Previous studies have recommended starting with automated testing to identify potential accessibility problems (Oud, 2012). Following automated testing, it is important to complete both user and expert testing to identify additional errors automated testing is not able to assess (Oud, 2012). User testing, for example, would allow postsecondary education institutions to better understand the kinds of barriers students with disabilities experience when navigating their sites (Oud, 2012). Expert testing on the other hand includes reviewing webpages and ensuring assistive technologies are compatible (Oud, 2012). According to Jaeger (2006) user testing appears to be the most helpful in identifying web accessibility

barriers. In contrast, Verkijika and De Wet (2018) argue that not only is an automated tool the fastest approach, but it is also equally as effective as user and expert testing. It is clear that more research needs to be done in this area to gain a better understanding of what tools are most effective. However, when using automatic testing tools, it is important to select a tool that is reliable and has the lowest false positive errors (Oud, 2012). Oud (2012) tested a number of automatic tools and found that Total Validator Professional Version had the lowest error rate and provides the most comprehensive assessment of WCAG errors.

Understanding Webpage Design

Automated testing tools evaluate WCAG cr HTML/XHTML code (Oud, 2012). HTML and XHTML are computer languages that are used to define the structure of content on a webpage (W3Schools, n.d.-c). For example, the headings, main content, sidebar, paragraph, footer, or images. Both languages have rules that webpage developers need to follow to ensure that browsers and assistive technologies can interpret the language correctly.

To structure content, webpage developers use HTML/XHTML tags (W3Schools, n.d.-a). For example, to organize text content by paragraphs, the tag `<p>` is used. If a webpage developer wanted to create separate paragraphs, they would need to use the opening tag `<p>` at the start of a paragraph and the closing tag `</p>` at the end. If a webpage developer wanted to create a title, they would need to use the opening tag `<title>` at the beginning and closing tag `</title>` at the end. Both languages have several different tags that webpage developers can use to structure their content. Tags can also be used to alter the presentation of content, for example the tag `` bolds text (W3Schools, n.d.-a).

To alter the presentation of content on a webpage, the World Wide Web Consortium (2018) recommends that webpage developers use Cascading Style Sheets (CSS). CSS is a computer language that webpage developers can use to style content on their webpage (W3Schools, n.d.-b). Essentially, CSS, is responsible for creating the look of the webpage. For example, CSS code can alter background color, font color, font style, and font size. Although webpage developers can alter font (e.g., bolding font) using HTML/XHTML code (W3Schools, n.d.-a), the W3C recommends that the structure and presentation of content on a webpage remain separate. Separating the presentation and structure of content of a webpage increases

Status on Web Accessibility in Canada

Few studies have explored web accessibility in a Canadian context. In 2013, Zap and Montgomerie conducted the first web accessibility evaluation of Canadian postsecondary institutions. The study used an automated web accessibility tool, Bobby, to evaluate the top-level or entry level webpage of the postsecondary website (Zap & Montgomerie, 2013). At the time, federal accessibility standards required all government websites to be free of both WCAG 1.0 Priority 1 and 2 errors by December 31, 2002 (Zap & Montgomerie, 2013). The WCAG 1.0 priority levels were

WCAG 2.1 conformance levels (i.e., Level A, AA, AAA), the WCAG 1.0 had three priority levels. Although educational institutions were not required to adhere to the federal standards, Zap and Montgomerie (2013) used the federal accessibility standards to explore web accessibility in postsecondary institutions. In November 2001 the authors found that only 6 out of the 350 university and college top-level front webpages assessed were free of Priority 1 and 2 errors. In November 2002 the authors re-evaluated the compliance rates of postsecondary institutions and found that 19 out of the 347 university and college top-level front webpages assessed were free of Priority 1 and 2 errors. Ten years later, in 2012, the authors re-evaluated the web accessibility of postsecondary institutions to determine whether any improvements had occurred (Zap & Montgomerie, 2013). The authors used the same conformance standards, WCAG 1.0, but a different automated tool called Testo Accesibilidad Web (TAW3) as Bobby was discontinued (Zap & Montgomerie, 2013). Despite having 10 years to improve web access, no significant gains were made in WCAG 1.0 compliance. The authors found that only 4 of the 383 university and college top-level front webpages assessed were free of both Priority 1 and 2 errors (Zap & Montgomerie, 2013). This means that only 1% of Canadian postsecondary top-

level front webpages complied with the WCAG 1.0 standards. The results are troubling and indicate that very little progress has been made to make websites more accessible for postsecondary students with disabilities. The lack of improvement is even more concerning, as at the time of the most recent re-evaluation, a new version of the WCAG guidelines (i.e., WCAG 2.0) had been released. These findings indicated that, while web accessibility guidelines were progressing, institutions were not since they were not even meeting the outdated requirements. The lack of compliance with the WCAG guidelines limits the ability of persons with disabilities to find, access, and use postsecondary information and services and highlights the need for further studies evaluating the web accessibility of postsecondary institutions in Canada (Zap & Montgomerie, 2013).

Oud (2012) found similar results when exploring the accessibility of university, college, and public library institutions in Ontario. At the time of the study, federal and provincial standards required organizations to comply with WCAG 2.0 Level AA guidelines. The homepage and 29 other pages from each university, college, and public library web site were assessed using Total Validator Professional Version and none of the 64 library web sites assessed complied with standards (Oud, 2012). Comeuax and Schmetzke (2007) also evaluated academic library websites in both Canada and the US and found that a majority of sites were still not accessible.

Previous Studies of Web Accessibility in Postsecondary Education

Internationally, a number of studies have evaluated the web accessibility of postsecondary institutions with the majority finding significant gaps in compliance with web accessibility standards (Zap & Montgomerie, 2013). A study conducted by Verkijika and de Wet (2018) yielded similar results. They used an automated tool to examine the WCAG Level 2.0

compliance of the homepages of 26 South African university websites and found that none complied with all of the WCAG 2.0 Level AA criteria. Similarly, Akgul (2020) explored the web accessibility of 179 Turkish university websites and found that only 14 universities met WCAG 2.0 Level A compliance standards. Consistent with these studies, Manez-Carvajal et al. (2019) found low levels of WCAG 2.0 compliance at the top 15 postsecondary institutions in Spain, Chile, and Mexico.

To gain a better understanding of the status of web accessibility of universities across the world, Campoverde-Molina et al. (2020) conducted a systematic literature review. The studies included in the review examined several different categories of university webpages, including the university homepage, search page, admissions homepage, and library homepage.

Interestingly, no studies included in this review examined Accessibility Services Offices homepages. The majority of studies evaluated the compliance of the homepage of the

various automated tools, including Total Validator (Campoverde-Molina et al., 2020). The homepage was likely chosen for evaluation as it performs two main functions. It introduces the user to the general content of the site and acts as a gateway to other information through the use of tools or links (Askehave & Ellerup Nielsen, 2005). Thus, if the homepage of a website is not accessible, the whole website is not. The results of the systematic review found that the majority of university webpages did not meet WCAG 2.0 Level AA accessibility standards (Campoverde-Molina et al., 2020). Specifically, across studies, 66% of webpages had Level A errors, 22% had Level AA errors, and 12% had Level AAA errors (Campoverde-Molina et al., 2020).

Present Study

University Student Accessibility Services Offices are the primary point of contact for students with disabilities to receive accommodations and support (Mullins & Preyde, 2013). In Ontario, postsecondary institutions are required to comply with WCAG 2.0 Level AA conformance standards, which aim to increase web accessibility (Government of Ontario, 2021a). As of January 1, 2021, all web content posted after January 1, 2012, must meet the WCAG 2.0 Level AA standards with the exception of success criteria 1.2.4 and 1.2.5, which relate to live captions and pre-recorded audio descriptions (Government of Ontario, 2021a). Although universities have been required to comply with these standards since early 2021, it is not clear whether this is actually the case.

The purpose of the present study was to examine Accessibility Services Offices' homepages' compliance with the most recent WCAG standards and to identify common errors to help inform recommendations. With the mission of Accessibility Services Offices being to encourage students with disabilities to disclose their disability, request accommodations, and develop self-advocacy skills, all aspects of their services need to be accessible, including their webpage. The study addresses two main research questions: (1) How easy is it to find the Homepage of Accessibility Services Offices for each Ontario University? and (2) Do the homepages for each Ontario University Accessibility Services Office comply with the WCAG 2.1 Level AA Web Accessibility Standards? There were two hypotheses. First, it was hypothesized that each homepage would easily be found using search terms entered into search engines. Secondly, based on previous research, it was hypothesized that there would be a low rate of compliance with all WCAG Level AA web accessibility standards.

Method

Sample

The sample consisted of the Accessibility Services Offices homepages of all English-speaking publicly funded universities in Ontario. A list is available in Table 3.

Materials

An automated tool, Total Validator Professional Version (Total Validator Pro 2, 2022),
Accessibility
Services Offices homepage. Total Validator Professional Version was selected because Oud
(2012) found that when compared to other automated tools, it produces the lowest false positive
errors and provides the most comprehensive assessment of WCAG errors.

The tool can also check for broken links and errors in HTML/XHTML and CSS code.

and the recommendation of Total Validator Professional
Version (Total Validator Pro 2, 2022), the tool was set to check for all WCAG 2.1 Level A and
Level AA errors, HTML/XHTML code errors, CSS code errors, and broken links.

Procedure

***Research Question 1: How Easy is it to Find the Homepage of Accessibility Services Offices
for Each Ontario University?***

First, the homepage of each university Accessibility Services Office was searched for
each Google search was the name of the university followed by the words Accessibility Services
(e.g., Algoma University Accessibility Services). The search term used for each institution
search engine search was Accessibility Services. If the homepage could be found using the

search terms, it was recorded as a yes. If the homepage could not be found using the search terms, it was recorded as a no.

of clicks needed to access the desired page (Jackson & Jones, 2014). Using the same evaluation process, the current study recorded the number of clicks needed to find the Accessibility Services Offices homepage for each university after the search terms were entered.

Research Question 2: Does the homepage for each Ontario University Accessibility Services Office comply with the WCAG 2.1 Level AA Web Accessibility Standards?

The province of Ontario only requires WCAG 2.0 Level AA compliance, however, the W3C recommends that institutions comply with the more recent WCAG 2.1 standards (World Wide Web Consortium, n.d.-e). Thus, the study examined compliance with the WCAG 2.1 Level AA standards. With accessibility as the goal, it is important that universities evolve with Web Accessibility standards, even if government policy lags behind.

determine accessibility of Ontario University Accessibility Services Offices homepages. In February of 2022, each Accessibility Services Offices homepage was evaluated by Total Validator Professional Version. First, the homepage link was copied and entered into the row titled *start page* on Total Validator Professional Version. Next, in the validations section, WCAG 2.1 AA was selected as the level of accessibility. Each of the following additional checks were selected: HTML, CSS, and broken link. HTML was set to auto-detect (i.e., total validator detected what version of HTML or XHTML language was used) and CSS was set to Level 3, which reflects the most recent rules.

Once the homepage link was entered and each validation was set, the validate button at the bottom was selected. The program then generated a report which included any WCAG 2.1 Level A or AA errors, HTML/XHTML errors, CSS code errors, parsing errors, or broken links. Although parsing errors is not a validation option, Total Validator Professional Version still generates specific error codes to describe HTML/XHTML parsing errors.

Results

Locating Accessibility Services Offices

The study explored how easy it was to find the homepage of Accessibility Services Offices engine. Every Ontario University Accessibility Services Offices homepage was found using both 3). It took one to two clicks to find each homepage following the search (see Table 3).

Compliance and Error Rates

The number of instances of each error was not a focus of the analysis. If an error was present multiple times on a Homepage, it was counted as one error. Although the total number of errors were reported for each institution, a main focus of the study was to find common errors across homepages to help inform recommendations.

All of the 21 Accessibility Services Offices Homepages assessed had WCAG 2.1 errors, meaning none of the universities fully complied with WCAG 2.1 Level AA standards. (See Table 4 for the number and type of errors for each university.) Across homepages, 100% ($N = 21$) had at least one WCAG 2.1 Level A error, and 71% ($n = 15$) had at least one WCAG Level AA error. McMaster University, OCAD University, and Ryerson University were found to have

the fewest WCAG 2.1 errors with a total of three errors each. Ontario Tech University was found to have the most WCAG 2.1 errors with a total of 996 errors.

Additionally, results showed that 90% ($n = 19$) of homepages had at least one HTML error, 57% ($n = 12$) had at least one parsing error, 19% ($n = 4$) had at least one CSS error, and 90% ($n = 19$) had at least one broken link.

Types of Errors

Across homepages, 10 common errors were found, which violated seven WCAG 2.1 success criteria (See Table 5 for a list of common errors and Table 6 for a description of these errors). The most commonly violated success criteria were associated with the following guidelines: 1.1: Text-Alternatives, 1.3: Adaptable, 1.4 Distinguishable, 2.4 Navigable, and 4.1 Compatible.

Success Criterion 1.3.1 Errors. The most common error code was P883, which was found on 71% ($n = 15$) of Homepages. A P883 error occurs when webpages do not nest headings properly (Total Validator, n.d.). The term, nesting a heading, refers to ordering headings in HTML using heading tags (i.e., H1-H6). Webpage developers are not allowed to skip heading levels (Total Validator, n.d.). For example, H2 tags must follow H1 tags and H3 tags must follow H2 tags (Total Validator, n.d.). If an H1 tag follows an H2 tag, a P883 error will occur as a heading level is skipped. Headings should be used to help users navigate content and understand the relationship between content (World Wide Web Consortium, n.d.-a). For example, H1 is typically used to indicate the page title, H2 for any major headings, and H3 for subheadings (Penn State Accessibility, 2017). When headings are used purely for presentation effects or ordered incorrectly, users that rely on screen readers will not be able to infer hierarchical meaning from the headings.

Another error code found which violated success criterion 1.3.1 was P892. A total of 24% ($n = 5$) of Accessibility Services Offices Homepages had a P892 error, which occurs when webpages do not use CSS for presentation effects (Total Validator, n.d.). An example of a common P892 error found was the use of bullet points in HTML rather than CSS. The separation of the structure (i.e., HTML) and presentation (i.e., CSS) of content allows users with visual disabilities to alter the text size, color, or text style without affecting the content or structure of content (World Wide Web Consortium, n.d.-b).

Success Criterion 1.4.4 Errors. The error code E910 was found on 43% ($n = 9$) of homepages. An E910 error occurs when webpages use absolute units and not relative units (Total Validator, n.d.). When webpage developers use absolute units, users are not able to change the size of the content on the webpage. In other words, the size of the content is fixed. For example, if the size of the content is 12 7920x 1.3.. um, n.BT

The error code E868 was found on 24% ($n = 5$) of homepages, which also violates success criterion 2.4.4. An E868 error occurs when there is an unnecessary duplication of text describing a link (Total Validator, n.d.). If webpage developers choose to represent the link with an image, they do not need to provide the same link te

incorrectly nested) they do not comply with HTML language rules. Incorrect nesting affects the ability of screen readers and some browsers to interpret the content correctly (Kyrnin, 2020).

Success Criterion 4.1.2 Errors. The most commonly violated success criterion was 4.1.2. The error code E956 was found on 43% ($n = 9$) of Homepages, the error code E958 was found on 33% ($n = 7$) of Homepages, and the error code E960 was found on 29% ($n = 6$) of Homepages. An E956 error occurs when the role attribute, which describes the role of an element in HTML, is not valid (Total Validator, n.d.). Role attributes tell assistive technologies what to do with an element. For example, an element with `role="button"` is treated as a button and not as a link (Accessibility Insights, n.d.). When the role attribute has an invalid value, assistive technologies are not able to respond correctly, which could result in the user not being aware of the element (Accessibility Insights, n.d.). An E958 error occurs when the webpage uses an attribute name that is not allowed for the role/context (Total Validator, n.d.). An E960 error occurs when the webpage uses the role `role="button"` or *aria-* in HTML to describe a focusable element (Total Validator, n.d.). These roles are not allowed to be used to describe a focusable element as it can result in assistive technologies not being able to interpret the element. Ultimately, when the role attributes are invalid or not allowed, assistive technologies are not able to interpret content accurately for the user.

Discussion

The purpose of this study was to explore the accessibility of Ontario University Accessibility Services Offices homepages. The study sought to answer two questions: (1) how easy is it to find the Homepage of Accessibility Services Offices for each Ontario University? and (2) does the homepage for each Ontario University Accessibility Services Office comply with the WCAG 2.1 Level AA Web Accessibility Standards? Based on previous research, it was

hypothesized that the homepage of each Accessibility Services Office could be located using the search terms and that there would be low rates of compliance with WCAG 2.1 Level A or AA standards. The findings support both hypotheses.

Research Question 1: How Easy is it to Find the Homepage of Accessibility Services Offices for Each Ontario University?

Each Accessibility Services Offices homepage was easily found using both the Google . The greatest number of clicks needed to access the homepage was two. These findings are consistent with Jackson and Jones (2014) who found that out of 40 community colleges, 37 disability services homepages and 40% were accessible in two clicks from the homepage. The current findings show that there is a short distance from the page that appears immediately after the search term is entered and the homepage of Accessibility Services Offices. Given the short distance, students should not have a hard time finding the homepage of their Accessibility Services Offices and, therefore, locating a Accessibility Services Offices homepage is unlikely to be a barrier for most students. However, although the homepage is easy to locate, this does not mean the information presented on that page is accessible.

Research Question 2: Does the homepage for each Ontario University Accessibility Services Office comply with the WCAG 2.1 Level AA Web Accessibility Standards?

Consistent with previous studies (e.g., Campoverde-Molina et al., 2021; Oud, 2012; Verkijika & de Wet, 2018), none of the Ontario University Accessibility Services Offices homepages complied with WCAG 2.1 Level AA standards. The 10 most common errors violated guidelines 1.1: Text-Alternatives, 1.3: Adaptable, 1.4 Distinguishable, 2.4 Navigable, and 4.1

Compatible. Although the errors varied across these guidelines, all of the errors make it difficult for users who rely on assistive technology to access the webpage content.

The Text-Alternatives guideline ensures that all non-text content is associated with a text alternative which is important for users with auditory and visual disabilities (World Wide Web Consortium, 2018). For example, users with auditory disabilities are able to access content contained in an audio file through reading the text alternative. Alternatively, users with visual disabilities are able to understand picture content through a screen reader that reads the text alternative to them. The current study found that many homepages failed to provide descriptive text for links or that they simply duplicated the link text which would not provide sufficient information. This is concerning given that homepage often acts as a gateway to other information and services through the use of links (Askehave & Ellerup Nielsen, 2005). The results suggest that students who rely on assistive technologies to access their Accessibility Services Offices homepage will likely experience difficulties in understanding the purpose of some links. This can result in students not knowing that they should follow a link or in them not being able to find a specific link. For example, students often have to fill out an online intake form when registering with Accessibility Services Offices and accessing this form would commonly be done by clicking on a link. If there is no descriptive text for this link, a student who has to rely on assistive technology may not be able to find it. Failing to provide a correct descriptive text for links also violates a success criterion associated with the Navigable guideline. The Navigable guideline strives to ensure that users can navigate websites and find content (World Wide Web Consortium, 2018). Both guidelines highlight the need for non-text content and forms to be labeled correctly so that assistive technologies can provide accurate interpretations.

The Adaptable guideline ensures that content can be presented and accessed in a number of different ways without losing the structure (World Wide Web Consortium, 2018). This is especially important for users with visual disabilities. Unfortunately, the most common error code found across homepages violated the adaptable guideline. A lack of compliance with this guideline prevents students from being able to use assistive technology to alter text size, color, or style in a way that allows for the structure of content (i.e., where text or images are located on the webpage) to be maintained. Essentially, the assistive technology is not able to do its job because the webpage does not use the correct computer language.

The Distinguishable guideline strives to make it easier for users to see and hear content (World Wide Web Consortium, 2018). Several homepages failed to meet all of the Distinguishable guideline success criteria. When webpages do not use relative units, as explained in the results section, users are not able to zoom in on content while maintaining the structure of the webpage (World Wide Web Consortium, n.d.-g). This means that when zooming in, the layout of content on the webpage (i.e., where text and images are placed) is not maintained. This poses a challenge for students with visual disabilities who rely on the zoom function to understand the webpage content.

The Compatible guideline had the greatest number of error codes associated with it. The goal of this guideline is to ensure that other browsers and assistive technologies can interpret the webpage (World Wide Web Consortium, 2018). A lack of compliance with the success criteria associated with this guideline leads to invalid HTML code. To ensure the HTML code is able to be interpreted by assistive technologies, proper names, roles, and values must be used. When proper names, roles, and values are not used, assistive technologies are not able to identify if an element is a button or link and may not notify the user of an element or content.

Previous Research

The findings from the current study are similar to Verkijika and de Wet (2018) results. Verkijika and de Wet (2018) which found that 100% of South African university websites violated criterion 1.1.1 and 85% violated criteria 1.3.1, 2.4.4, and 4.1.1. The current study showed that 71% violated criteria 1.3.1, 43% violated 1.1.1/2.4.4, and 57% violated 4.1.1. The results from the current study are concerning, as the majority of the violations are at Level A conformance, which are fundamental to web accessibility (Verkijika and de Wet, 2018). A failure to comply with Level A success criteria results in significant accessibility barriers for a majority of persons with disabilities.

In addition to WCAG errors, 90% of homepages had at least one HTML error and 90% had at least one broken link. These results are alarming as it is known that broken links can prevent users from accessing the desired resources (Rajabi et al., 2014). As websites continue to grow and change, it is especially important to frequently check webpages for broken links (Verkijika and de Wet, 2018).

Legal Implications

Persons with disabilities have a right to accessible Web information. The Government of Ontario has made this clear, as the Accessibility for Ontarians with Disabilities Act requires organizations, including postsecondary institutions, to comply with WCAG 2.0 Level AA standards as of January 2021 (Government of Ontario, 2021). It is concerning that a year after this deadline, no Ontario University Accessibility Services Offices webpage currently complies with the set standards. As noted earlier, several of the errors identified through the automated tool violated success criteria that were included in the WCAG 2.0 standards. Therefore, the

errors found are not new to the 2.1 version and indicate a failure to comply with the WCAG 2.0 Level AA standard.

Student Implications

Web accessibility standards exist to remove barriers for persons with disabilities and increase accessibility for everyone, including individuals without disabilities (World Wide Web Consortium, 2021). University Accessibility Services Offices have a similar goal of removing barriers for students with disabilities and provide them with required accommodations (Ontario Human Rights Commission, n.d.-a). In Ontario, there are laws that guide the provision of Accessibility Services Offices (Ontario Human Rights Commission, n.d.-b) and webpage design (Government of Ontario, 2021); however, for these services to be effective, laws and standards must be implemented and evaluated. It is clear from the findings that each institution will need to make several changes before they can consider the important information that is available on Accessibility Services Offices homepages fully accessible. Additionally, these results suggest postsecondary students across Ontario may experience barriers accessing Accessibility Services Offices at the webpage level. It is important for students to know that they have a right to request that information be presented in an alternate accessible format (Government of Ontario, 2021). Students need to be aware of the responsibilities of their institution and their individual rights if their institution fails to comply with set standards.

Recommendations for Universities

It is concerning that the most common error found violates a guideline and criterion that aims to ensure information and relationships implied by the webpage formatting are preserved when using various assistive technologies. Studies have shown that many users have to rely on assistive technologies to access web information (Dobransky & Hargittai, 2016). The findings of

the present study also highlight the limits of assistive technologies if webpages are not designed in a way that supports them. With assistive technologies being recommended as a common accommodation for students through Accessibility Services Offices, it is imperative that the Accessibility Services Offices homepage and institutions website are designed in a way that supports these technologies.

To fix current errors, it is recommended that university institutions visit the WCAG website (<https://www.w3.org/WAI/WCAG21/quickref/?showtechniques=121#info-and-relationships>) to learn more about the criteria their webpages have violated. On the webpage, beside each criterion, is a list of common errors and techniques that can be used to fix them. To prevent future barriers, it is recommended that university institutions complete automated testing each time new information is uploaded to a webpage. Using a tool such as Total Validator Professional Version is recommended, as it identifies the specific problem that needs to be resolved for a criterion to be met. It is also recommended that each year, institutions complete both user and expert testing to ensure that barriers that cannot be identified through automated testing are addressed.

To make students aware of the current errors and remind them of their right to request information in an accessible format, it is recommended that universities establish reporting procedures. It is important that universities have a process in place that allow students to report web accessibility errors and request an alternate accessible version of the information. A reporting process also increases transparency and affirms that the university is committed to resolving errors. Once an error is fixed, the university should notify students as this may mean that students no longer have to request information in an alternate format as they will be able to

access it from the browser. Set timelines for resolving errors should be included in the reporting procedures.

Limitations and Future Research

Since this study only used automated testing, no definitive comment can be made regarding the effect of the lack of WCAG compliance on student experience. Although automated accessibility tools are found to be effective in evaluating the accessibility of webpages, there are inherent limitations to using them (Oud, 2012). First, automated tools can only assess the HTML code (Oud, 2012). Therefore, a significant number of criteria cannot be assessed. Examples of guidelines that an automated tool cannot evaluate relate to how simple a webpage is or how clear the language used is (Oud, 2012). Thus, this study is not able to provide a full overview of WCAG Level 2.1 compliance.

The extent to which one can interpret and generalize results is also a limitation of the study. The methodology used allows for the identification of compliance errors but does not provide information on user experience. So, it is unclear how the number and type of errors might be possible that a user could find a page with 40 errors more accessible than a page with 1 error.

Future research should continue to explore the accessibility of Ontario University Accessibility Services Offices using both expert testing and user testing. This would help provide a more comprehensive picture of Web accessibility. It will be important to about hear the experiences of students with disabilities as they attempt to find and use Accessibility Services Office webpage. Additional research is also needed to explore the web accessibility of other services and departments related to the institution, including the portal (i.e., Ontario U Application Centre) used to apply to postsecondary institutions in Ontario.

School Psychology Practice Implications

Postsecondary education is a goal for many secondary school students with disabilities and school psychologists when helping to develop programming and recommending services (Talapatra et al., 2018). Interestingly, research has found that school psychologists are not often involved in transition services despite having knowledge about psychoeducational assessment, consultation services, interventions, program evaluations, and data-driven decision making (Talapatra et al., 2019). Talapatra et al. (2019) recommend that school psychologists be involved in transition planning, as their areas of expertise put them in a position to effectively communicate with organizations, vet resources, and create and monitor goals. Currently, in Canada, there is very limited information on how school psychologists can be involved in and support transition planning, including transition-related assessment (Talapatra et al., 2019).

Connecting students with Accessibility Services Offices or encouraging students to register with Accessibility Services Offices is a common recommendation included in psychoeducational assessment reports as it can help to ensure a smooth transition of accommodations. The results of the current study suggest that students may experience barriers at the webpage level when trying to access information about Accessibility Services Offices. As such, it is recommended that school psychologists make students aware of their rights and help them register with Accessibility Services Offices to help mitigate any possible webpage barriers.

Conclusions

The literature shows that students with disabilities continue to experience barriers during their postsecondary education despite protective legislation. It is the role of postsecondary Accessibility Services Offices to help remove these barriers and provide students with the

necessary accommodations/tools so that they can access educational opportunities (Ontario Human Rights Commission, n.d.-a). Unfortunately, research has found that many students are not aware of the services available to them (Mullins & Preyde, 2013) or experience significant barriers trying to access them (Ontario Human Rights Commission, n.d.-a). The current study provides information about whether the homepage of each Ontario University Accessibility Services Office complies with the most recent WCAG. While the homepage of each Accessibility Services Office was easy to locate, none complied with the most recent web accessibility standards (i.e., WCAG 2.1 Level AA). This means that students should not have a hard time locating the homepage but may experience barriers accessing information on the homepage or links from that page as several WCAG errors were found. If students cannot access information on Accessibility Services Offices webpages, students may lack knowledge about services available, have difficulties registering for services, and experience problems requesting accommodations.

As postsecondary institutions work towards full compliance with WCAG 2.1 Level AA standards, it is important for more research in this area to be done. The current study should be used as a starting point in understanding more about the possible barriers experienced by students navigating their Accessibility Services Offices. All students have a right to accommodations and accessible web content which means that postsecondary institutions have an obligation to identify and remove barriers to ensure that Accessibility Services Offices are indeed accessible.

Table 1*WCAG 2.1*

Principle	Guidelines	Success Criteria and Conformance Level
Principle 1: Perceivable	Guideline 1.1: Text Alternatives	Criterion 1.1.1: Non-text Content *
	Guideline 1.2: Time-based Media	Criterion 1.2.1: Prerecorded Audio-only and Video-only * Criterion 1.2.2: Prerecorded Captions * Criterion 1.2.3: Audio Description or Media Alternative * Criterion 1.2.4: Live Captions ** Criterion 1.2.5: Prerecorded Audio Description **
	Guideline 1.3: Adaptable	Criterion 1.3.1: Info and Relationships * Criterion 1.3.2: Meaningful Sequence * Criterion 1.3.3: Sensory Characteristics * Criterion 1.3.4: Orientation ** Criterion 1.3.5: Identify Input Purpose **
	Guideline 1.4: Distinguishable	Criterion 1.4.1: Use of Color * Criterion 1.4.2: Audio Control * Criterion 1.4.3: Contrast ** Criterion 1.4.4: Resize Text ** Criterion 1.4.5: Images of Text ** Criterion 1.4.10: Reflow ** Criterion 1.4.11: Non-text Contrast ** Criterion 1.4.12: Text Spacing ** Criterion 1.4.13: Content on Hover or Focus **
Principle 2: Operable	Guideline 2.1: Keyboard Accessible	Criterion 2.1.1: Keyboard * Criterion 2.1.2: No Keyboard Trap * Criterion 2.1.4: Character Key Shortcuts *
	Guideline 2.2: Enough Time	Criterion 2.2.1: Timing Adjustable * Criterion 2.2.2: Pause, Stop, Hide *
	Guideline 2.3: Seizures and Physical Reactions	Criterion 2.3.1: Three Flashes or Below Threshold *

Principle	Guidelines	Success Criteria and Conformance Level
	Guideline 2.4: Navigable	Criterion 2.4.1: Bypass Blocks * Criterion 2.4.2: Page Titled * Criterion 2.4.3 Focus Order * Criterion 2.4.4: Link Purpose * Criterion 2.4.5: Multiple Ways ** Criterion 2.4.6: Headings and Labels ** Criterion: 2.4.7: Focus Visible **
	Guideline 2.5: Input Modalities	Criterion 2.5.1: Pointer Gestures* Criterion: 2.5.2: Pointer Cancellation * Criterion 2.5.3: Label in Name * Criterion 2.5.4: Motion Actuation *
Principle 3: Understandable	Guideline 3.1: Readable	Criterion 3.1.1: Language of Page * Criterion 3.1.2: Language of Parts **
	Guideline 3.2 Predictable	Criterion 3.2.1: On Focus * Criterion 3.2.2: On Input * Criterion 3.2.3: Consistent Navigation ** Criterion 3.2.4: Consistent Identification **
	Guideline 3.3: Input Assistance	Criterion 3.3.1: Error Identification* Criterion 3.3.2: Labels or Instructions * Criterion 3.3.3: Error Suggestion ** Criterion 3.3.4: Error Prevention **
Principle 4: Robust	Guideline 4.1: Compatible	Criterion 4.1.1: Parsing *
		Criterion 4.1.2: Name, Role, Value * Criterion 4.1.3: Status Messages **

Note. * Indicates Level A compliance and ** indicates Level AA compliance. The information in

this table is from the World Wide Web Consortium (2018).

Table 2*WCAG 2.1 Levels of Conformance*

Conformance Level	Number of Associated Success Criteria
Level A	30
Level AA	20
Level AAA	28

Table 3*Search Engine Results and Number of Clicks Needed*

Institution	Google Search	Clicks using Google	University Search Engine	Clicks using University
Algoma University	Yes	1	Yes	1
Brock University	Yes	1	Yes	1
Carlton University	Yes	1	Yes	1
Lakehead University	Yes	1	Yes	1
Laurentian University	Yes	1	Yes	1
McMaster University	Yes	1	Yes	1
Nipissing University	Yes	1	Yes	1
OCAD University	Yes	1	Yes	1
Ontario Tech University	Yes	2	Yes	2
Queens University	Yes	1	Yes	1
Royal Military College	Yes	1	Yes	2
Ryerson University	Yes	1	Yes	2
Trent University	Yes	1	Yes	1
University of Ottawa	Yes	1	Yes	2
University of Guelph	Yes	2	Yes	2
University of Toronto	Yes	1	Yes	1
University of Waterloo	Yes	1	Yes	1
University of Windsor	Yes	1	Yes	1
Western University	Yes	1	Yes	1
Wilfred Laurier University	Yes	1	Yes	1

Institution	Google Search	Clicks using Google	University Search Engine	Clicks using University
York University	Yes	1	Yes	1

Note. Google Search whether the Homepage could be located using a google search. Clicks using google shows the number of clicks needed to arrive at Accessibility Services Offices homepage from Google results list. University Search Engine shows whether the Homepage could be of clicks needed to arrive at Accessibility Services Offices homepage from the university search engine results list.

Table 4*Total Web Accessibility Errors on Each Homepage*

Institution	Error Types						Total Errors
	HTML	Parsing	CSS	Broken Links	WCAG 2.1 Level A	WCAG 2.1 Level AA	
Algoma University	5	2	0	8	633	3	651
Brock University	9	0	1	9	66	2	87
Carlton University	20	0	0	4	14	1	39
Lakehead University	8	0	0	2	7	2	19
McMaster University	11	0	1	1	3	0	16
Nipissing University	3	1	0	29	24	0	57
OCAD University	4	6	0	3	3	0	16
Ontario Tech University	319	0	1	4	996	0	1320
Queens University	32	9	0	4	25	4	74
Royal Military College	0	0	0	0	52	2	54

Institution	Error Types						Total Errors
	HTML	Parsing	CSS	Broken Links	WCAG 2.1 Level A	WCAG 2.1 Level AA	
Ryerson University	10	1	0	1	1	2	15
Trent University	2	1	0	4	4	1	12
University of Guelph	4	1	0	0	2	7	14
University of Ottawa	432	14	0	34	270	28	778
University of Toronto	7	1	0	4	19	3	34
University of Waterloo	0	0	0	7	50	0	57
University of Windsor	87	4	0	4	9	2	106
Wilfred Laurier University	25	0	0	3	83	0	111
Western University	4	0	0	1	9	2	16
York University	12	1	0	8	5	1	27
Laurentian University	31	5	10	6	29	38	119

Table 5*Most Common Errors Across Homepages*

Error Code	Violated Success Criterion	# of Homepages with Errors	% of Homepages with Errors
P883	1.3.1 (Level A)	15	71%
E954	4.1.1 (Level A)	12	57%
P871	1.1.1/2.4.4 (Level A)	9	43%
E956	4.1.2 (Level A)	9	43%
E910	1.4.4 (Level AA)	9	43%
E913	2.4.6 (Level AA)	8	38%
E958	4.1.2 (Level A)	7	33%
E960	4.1.2 (Level A)	6	29%
P892	1.3.1 (Level A)	5	24%
E868	2.4.4 (Level A)	5	24%

Note. The Total Validator (Professional Version) error codes are listed along with the success criterion that the error violates. See Table 6 for explanation of numerical codes.

Table 6*Description of Error Codes and Violated Success Criteria*

Error Code	Description of Violated Success Criterion	Description of Error
P883	1.3.1 (Level A) content needs to be able to be presented in a number of ways without losing information or structure (World Wide Web Consortium, 2018).	Error P883 occurs when webpages do not nest headings properly in the correct order (Total Validator, n.d.).
E954	4.1.1 (Level A) webpages need to maximize compatibility with user agents and assistive technologies (World Wide Web Consortium, 2018).	Error E954 occurs when a tag, content, or interactive elements are not allowed (Total Validator, n.d.).
P871	1.1.1 (Level A) webpages must provide text alternatives for any non-text content (World Wide Web Consortium, 2018). 2.4.4 (Level A) webpages must provide ways to help users find content, navigate content, and determine where they are on the website (World Wide Web Consortium, 2018).	Error P871 occurs when descriptive text for a link is missing (Total Validator, n.d.).
E956	4.1.2 (Level A) all interface components must have a name and role that can be pragmatically determined (World Wide Web Consortium, 2018).	Error E956 occurs when the valid of the role attribute is not valid (Total Validator, n.d.).
E910	1.4.4 (Level AA) webpages must make it easy for users to see and hear content (World Wide Web Consortium, 2018).	Error E910 occurs when webpages use absolute units and not relative units (Total Validator, n.d.).
E913	2.4.6 (Level AA) headings and labels must be descriptive (World Wide Web Consortium, 2018).	Error E913 occurs when form control labels are not unique (Total Validator, n.d.).

Error Code	Description of Violated Success Criterion	Description of Error
E958	4.1.2 (Level A) all interface components must have a name and role that can be pragmatically determined (World Wide Web Consortium, 2018).	E958 occurs when the attribute name is not allowed for the role/context Total Validator, n.d.).
E960	4.1.2 (Level A) all interface components must have a name and role that can be pragmatically determined (World Wide Web Consortium, 2018).	E960 occurs when the webpages use role - in some users not being able to focus on anything (Total Validator, n.d.).
P892	1.3.1 (Level A) content needs to be able to be presented in a number of ways without losing information or structure (World Wide Web Consortium, 2018).	P892 occurs when webpages do not use CSS for presentation effects (Total Validator, n.d.).
E868	2.4.4 (Level A) webpages must provide ways to help users find content, navigate content, and determine where they are on the website (World Wide Web Consortium, 2018).	E868 occurs when there is an unnecessary duplication of text describing a link (Total Validator, n.d.).

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