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COMMENTARY

Accommodating workers with disabilities in the post-Covid world

Katherine A. McNamara[a] and Penney Mason Stanch[b]

[a]Department of Environmental and Occupational Health, California State University, Northridge, California; [b]Stanch Worker Health LLC, Austin, Texas

The Covid-19 pandemic has upended the way we work, raising challenges but also rapidly accelerating the adoption of digital technologies to facilitate remote work. Although remote work poses certain ergonomic challenges, it also offers much needed opportunities to accommodate workers with disabilities. In 2019, over 30 million working age adults were living with a disability, yet less than 20% of them were employed, and their unemployment rate has averaged twice that of adults without disability for the last decade (Bureau of Labor Statistics (BLS), U.S. Department of Labor, The Economics Daily 2020). Since the pandemic, unemployment for disabled workers increased by 60% compared to 44% for workers without disabilities (Bureau of Labor Statistics (BLS), U.S. Department of Labor 2021). Disabled workers can suffer from a "first out, last back" phenomenon during downsizing and face a more challenging path back to employment, as they will compete in the labor market with nondisabled workers (Newman 2021). Moreover, the number of workers living with permanent physical or intellectual disabilities requiring reasonable accommodation to successfully maintain employment is reportedly increasing, making effective workplace accommodations essential to support and retain disabled workers (Zablotsky et al. 2019). Industrial hygienists, who have traditionally facilitated workplace accommodations for temporary disabilities following an injury (return to work), now have an opportunity and an obligation to rethink our services to be more inclusive and help maintain productive and stable employment for this vulnerable population. Here, we highlight technological advances, utilized during the pandemic to facilitate work from home, that can be implemented post-pandemic as part of a strategy to increase accessibility for a range of disabilities. We review employer requirements under U.S. laws and identify simple practices to streamline compliance, with a focus on technology tools to expand accessibility in instructional media and digital content.

The Americans with Disabilities Act (ADA) defines an individual with a disability as "a person who has a physical or mental impairment that substantially limits one or more major life activities, a person who has a history or record of such an impairment, or a person who is perceived by others as having such an impairment" (ADA 2020). The ADA does not specifically name all the impairments that are covered. While mobility limitations and sensory impairments may be recognizable in the workplace through the presence of assistive technology or aids, other disabilities may not be visible. Hidden disabilities include a wide range of physical, cognitive, and psychological conditions that may not have obvious manifestations, including chronic disease (diabetes, rheumatoid arthritis) and intellectual disabilities. Intellectual disabilities involve problems with intellectual functions (learning, problem solving, judgment) and adaptive functions (communication, independent living) (Tassé 2016). Learning disabilities refers to a group of information-processing problems that can manifest as difficulties with language or math as well as struggles with cognitive functions such as attention, executive function and abstract reasoning (LDA 2021). Disabilities and their symptoms typically change over an employee's lifespan and career, increasing with age (Bonaccio et al. 2020). Employment data suggests that as disabled workers age, they are less likely to be working

Table 1. Suggested accommodations for in person and online meetings and presentations.

Impairment	Accommodation[A]	
	In Person/In Office	Online/Remote
Mobility impairment *Wheelchair users, those experiencing some loss of function (either from chronic disease or injury)*	Designate accessible space up front at a 3:1 ratio for each participant requiring accommodation Walk through facility to ensure minimum turning space and circulation widths are met	Ensure custom keyboards/ trackballs and speech to text software are available for home office Design materials with "no mouse" users in mind. Use "select" instead of "click" for instructions
Vision impairment *Low vision, color blind, blind*	Provide print materials in advance Describe all images with alt text captions Enable use of reader software and organize screen content from left to right/top to bottom Use Table of Contents and Styles formatting in text documents to allow screen readers to recognize document structure Include column and row headers in all tables Use hyperlinked descriptive text in place of urls Use a digital color contrast analyzer Provide large-print materials upon request Read aloud white board contents	 Make screen navigation simple and intuitive
Hearing impairment *Deaf, hard of hearing*	Provide note takers and/or sign language interpreters Ensure accurate captioning of all video content Assess acoustic conditions Use amplification system compatible with hearing aids Face audience to facilitate lip reading Provide see through masks	 Use a mic to improve audio quality/reduce background noise Ensure adequate lighting on speaker for lip readers Enable a private chat between interpreters and participants Generate and circulate transcript following meeting
Intellectual or cognitive impairment *Learning disabilities, ADHD, dyslexia, autism spectrum disorders, etc.*	Distribute a copy of text materials in advance Simplify visual media and organize content Limit conversations to one speaker at a time Decrease audio and visual stimuli	 Incorporate breaks into videoconferencing schedule Suggest speaker view instead of gallery, and hiding self view Provide recording

[A]Based on guidance published by the National Disability Authority: Improving the Accessibility of School Buildings – The Classroom (NDA 2012) and the California State University, Northridge Universal Design Center, Accessibility and Universal Design Tutorial (CSUN 2021).

(Bureau of Labor Statistics (BLS), U.S. Department of Labor 2021).

Legal requirements for employers

Title I of the ADA requires employers with 15 or more employees to provide qualified individuals with disabilities equal opportunity for employment, including "reasonable accommodation to the known physical or mental limitations of otherwise qualified individuals with disabilities, unless it results in undue hardship." Titles II (state and local governments) and III (public accommodations and commercial facilities) provide requirements for accessible design, originally intended for the design of facilities to eliminate physical barriers. More recently, accessibility refers to the characteristic that products, services, and facilities can be independently used by people with a variety of disabilities.

Section 508 of the United States Rehabilitation Act was enacted to eliminate barriers in information technology and to encourage development of technologies to improve accessibility (General Services Administration (GSA) 2020). Section 508 is particularly relevant to remote work as it requires accessibility for electronic media using assistive technology and requirements for digital content. Implementation of Section 508 requirements in the private sector vary from state to state, and digital content that predates the 2018 Revised 508 Standards do not require modification. But updates to Section 508 have resulted in significant advances in the universal design of instructional media, to improve accessibility and make content formats consistent for the benefit of many types of learners. Thus, any digital content prepared since the pandemic (including conference presentations, webinars, and online health and safety training) are subject to Section 508 requirements.

Complying with these guidelines and advocating for the health and safety of disabled employees requires a multi-disciplinary team approach. Cultivating a network of resources streamlines the accommodation process and makes troubleshooting complex issues easier. An effective inclusion team

should have members from human resources (HR), the equal employment office (EEO), facilities management, information technology (IT), and the health and safety department. HR and EEO are typically responsible for Title I compliance, while Facilities will maintain compliance with Titles II and III. Industrial hygienists can assist HR as well as managers when onboarding a new worker with a disability or accommodating the return of an employee with restrictions. Disabled individuals have the most complete knowledge about their own capabilities and limitations, and open communication can often help identify the best accommodation. The earlier an organization provides an accommodation, the lower the costs (Bonaccio et al. 2020). Accommodations do not have to be expensive to be effective. The Job Accommodations Network (JAN) has tracked accommodation costs since 2004 and indicates that 56% of survey respondents reported zero cost accommodations (e.g., providing access to a closer parking lot). Of the accommodations that did involve a one-time expenditure, the median cost was $500 (Job Accommodation Network (JAN) 2020). Fortunately, many of the accommodations required under Section 508 for digital media are cost neutral—they have been incorporated into existing software packages or are available as free downloads. The employer's IT Department should provide guidance and resources for Section 508 compliance. But because health and safety training is a significant portion of the industrial hygienists' duties, detailed coverage of Section 508 accommodations for instructional media is provided herein.

Technology tools and practices to increase accessibility

In recent years, there has been a proliferation of new technologies and design guidelines that aim to increase accessibility for all users. Assistive technology for digital media can include equipment (keyboard, trackball) or software (screen readers, speech recognition, magnification software, and captioning) and may benefit a range of users. Table 1 summarizes different accommodations by disability type for the in person/in office and remote/online environment. Simple modifications can make meetings, presentations, and trainings (both online and in person) more accessible, regardless of whether the format is instructor-led or asynchronous computer-based training. Potential benefits extend well beyond legally disabled workers, to accommodate people with different learning styles and

home work environments. Several of these accommodation strategies warrant additional discussion. Screen readers convert digital text to speech for workers who are visually impaired, but they can only process fully editable text. Because a screen reader cannot "read" images such as figures, photos, or graphs, the tool must read alternative image text (alt text) that is attached to the image through a utility in the software. Adding alt text varies by software application. The alt text should give a concise description of the image and provide context; consider what information would be missing without the image. All videos in websites and presentations should incorporate captioning to ensure accessibility to workers who are hearing impaired. Preview the captions to identify and correct common typos, replace missing punctuation, and attribute quotes to speakers. For all word processed documents, Microsoft Office has an Accessibility Checker that will help identify obstacles to text reader software. Once you have verified that your digital content is accessible, provide these materials in advance as often as possible. Finally, as there are a range of disabilities that can slow information processing, it can be helpful to provide an alternate version of content either in advance or following presentations or meetings.

Obstacles and opportunities from the pandemic

Since March 2020, the work environment has undergone extraordinary changes in response to the pandemic, as stay-at-home orders and social distancing policies mandated work from home. As more work is being performed remotely and more meetings are conducted virtually, new opportunities for disabled workers have emerged. Inclusive practices that may have previously been viewed as special requests are now suddenly routine. A national survey reveals that many of these accommodations are among those most frequently requested by disabled workers in the past. In July 2019 the Bureau of Labor Statistics updated an assessment of barriers and assistance to disabled workers (Bureau of Labor Statistics (BLS), U.S. Department of Labor 2020). Disabled workers were about 10% less likely to commute in their personal vehicle, and 3% more likely to work from home. Telecommuting makes sense for workers with physical disabilities: setting aside the complexity of commuting, individuals with mobility limitations can still be expected to negotiate an unexpected set of stairs or encounter a malfunctioning elevator to attend an in-person meeting in a new location. Disabled workers

in the survey were also 8% more likely to require flexible work hours. Control over work organization is more easily met in the home work environment, where increased flexibility can also accommodate reduced work pace, necessary breaks, and a modified schedule. For employees with autism spectrum disorders, videoconferencing may provide some relief from the social anxieties triggered by in person interactions. Even simple expectations of small talk before and after meetings, engaging in group discussions, or participating in break-out sessions can be taxing (Sklar 2020). The remote work environment enables more individual control over work interactions, potentially alleviating some of this strain.

However, there have been consequences as well. Employees with low vision may not be able to participate fully in the demanding visual environment of a Zoom gallery (Newman 2021), where remembering to look at the camera, while constantly monitoring one's self image, other participants, and any shared media create non-verbal overload (Bailenson 2021). In fact, the term Zoom fatigue has recently been coined to describe the effects of prolonged videoconferencing on the brain and psyche (Lee 2020). Increased eye strain and vigilant attention, combined with the distractions of lagging or interrupted audio, an inability to make eye contact with speakers, constant self-evaluation, and the challenge of sustaining focus in gallery format screens are thought to overtax the brain (Lee 2020; Sklar 2020). Some users report a more severe syndrome–including symptoms of vertigo, nausea and migraine headaches–that mimic cybersickness. Deaf and hearing-impaired workers report fatigue and stress due to the concentration and hypervigilance needed to compensate for their hearing loss (Punch 2016). This can be exacerbated during extended hours of videoconferencing when audio quality is inconsistent. Furthermore, videoconferencing is more sedentary than in person meetings or instruction (Bailenson 2021). To alleviate some these symptoms, basic ergonomic principals can be applied to reduce strain, such as eliminating unnecessary onscreen stimuli, cutting back on multitasking during videoconferences, changing communication modalities (from videoconferencing to phone calls or emails), and incorporating rest breaks and brief exercise into the work day. In addition, the visual stimuli of Zoom can be reduced by hiding the self view, and defaulting to speaker view rather than gallery (Bailenson 2021). Finally, while the obvious benefits of working from home have been broadly documented, increased social isolation has also been reported by those who live alone during the pandemic (Banerjee & Rai 2020), and increased stress and work life conflict have been reported by women, parents, and care givers (McLaren et al. 2020; Lyttelton et al. 2020). It is important to remember that the grand telecommuting experiment of 2020–2021 coincided with the closure of schools and childcare facilities, and eliminated most social activities. These concomitant changes make it difficult to measure the success of this recent shift to telecommuting on overall worker well-being.

Moving forward, it is anticipated that employers will adjust to a hybrid workplace in which work hours are split more evenly between home and office. This offers opportunities and some potential costs with regard to accommodating workers with disabilities. In particular, the ergonomics of home offices is a thorny issue and warrants a more detailed examination. More broadly, the pandemic may tragically produce a new population of disabled workers, as a portion of Covid-19 survivors develop Long Covid, which may progress like other post-infection fatigue syndromes into Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS), a disabling and uncurable disease (Islam et al. 2020; Komaroff 2020; Nabavi 2020). But it is important to recognize that the shift toward increased remote work has removed a number of barriers for disabled workers, and the wide uptake of these accessible technology tools could eliminate even more, if organizations deploy them with appropriate attention to equity. It will be some time before we fully understand the impacts of 2020's rapid shift to remote work for the majority of work interactions and the impact of the pandemic on the disabled community, but this unique moment presents a historic chance to increase accessibility for workers with a range of disabilities.

ORCID

Katherine A. McNamara (iD) http://orcid.org/0000-0001-7220-8255

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