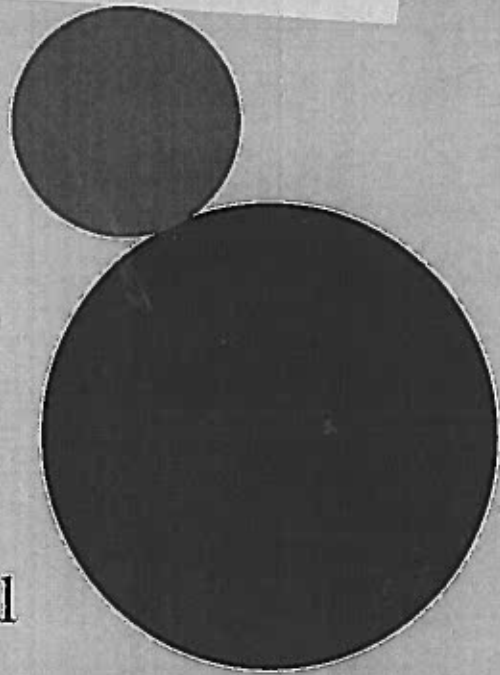


Edited by
Amber L. Lancaster
Carie S. Tucker King

Amplifying Voices in UX

Balancing
Design and User
Needs in Technical
Communication



Chapter 9

Inclusive Measures

Establishing Audio Description Tactics that Impact Social Inclusion

BRETT OPPEGAARD AND MICHAEL K. RABBY

Visual media has not dominated the world—like it does today—for long. For most of humanity, in fact, only the most privileged people even had access to it. But during the democratizing movements of the Renaissance, ocularcentrism began to bloom as a part of our global media ecology, bringing to the masses vision-oriented technologies such as linear perspective, eyeglasses, the microscope, the telescope, and the printing press (Dolmage, 2014; Meadows, 2002). With such sudden availability of these eyeball extensions, everyone suddenly wanted to look, regardless of who was left out in that process, and a frenzied demand for visual media started to spread (Comolli, 1980; Mirzoeff, 2016).

All media systems tend to favor some types of people over others through the choices made by the designers. At this point in time, those who can see and see well—across demographics, mediums, interfaces, cultures—tend to benefit most from just about any media-design choice. In the latest round of social separation between the sighted and the visually impaired, digital channels of all kinds have sprouted in the past two decades and now are pumping out unprecedented amounts of visual media, including the posting *every minute* of about 240,000 photos on Facebook;

65,000 photos on Instagram; and 500 hours of video on YouTube (Statista, 2020, 2021). Most of that visual information circulating throughout the global community is inaccessible to people who cannot see it.

Based on a tally by the World Health Organization (2022), though, billions of people around the world are now blind, Deafblind, or with low vision. Instead of receiving due recognition as a massive and important subset of the global population, these people have been transformed into pariahs unable to function in many social situations. Their offense? They have poor vision. They are not adept at navigating the complexities of a visual environment that requires not only sensory data through the eyes but also the ability to use that data to make sense of a complicated set of intellectual and physical relations, combining information, imagination, and insights into a material and psychic space (Mirzoeff, 2011). Modern media designers, with a goal of social justice, can do something significant about this massive disconnection and do it without disrupting the global media ecology (Agboka, 2013; Getto & Sun, 2017; Gonzales & Zantjer, 2015; Shivers-McNair, 2017). There's a common media-enriching approach called Audio Description, for example, and this chapter will present research resulting in five novel, experimental, and straightforward best practices for designers to use to try to connect with non-visual audiences through it. This approach could serve as a model for ways in which accessibility can be explored through intersections with technical communication research, especially in cases where researchers take an active part in the development of production processes and public products (Melonçon, 2013; Moore, 2017; Oswal, 2013).

Like alt-text, only more-detailed and evocative, Audio Description typically is conceptualized as an accommodation, a service, or an add-on feature, aimed at helping blind people know what can be seen in their vicinity. As a remediation process, it involves a symbiotic relationship between multiple people, including at least one sighted person willing to share what is being seen. That person will provide an audible description that can be heard, or a textual description that can be audibilized via a screen reader, or a textual description that can be made tactile by a Braille e-reader. Empirical research about Audio Description, though, exists in only a nascent state, especially outside of journals and books that specialize in disability studies. This chapter demonstrates its potential for wider appeal.

While health communication is a common research area across disciplines, for example, few research studies to date link Audio Description to potential impacts on public health, even in tangential ways. One possible

path of
social e
in any
exclude
also ty
includi
defined
a perso
et al., 2

Pe
abilities
inclusio
a guide
to peop
who are
a disad
gatherir
cues to
any ind

In
accessib
caused
includir
and the
demand
welcom
for any
and bin
But mec
vary gre
if allow
for you
environ
a topic
of abstr
titioner
everyday
to descr
of visua

path of inquiry to connect these ideas therefore is through the concept of social exclusion/inclusion. Anyone can be socially excluded (or included) in any specific context, but people with disabilities, in general, tend to be excluded far more often than most people in all sorts of situations. They also typically have poorer health because of such widespread exclusion, including a higher likelihood of having secondary conditions, broadly defined as “medical, social, emotional, family, or community problems that a person with a primary disabling condition likely experiences” (Castro et al., 2018, p. 2).

People who cannot see or see well, as a subset of people with disabilities, have complex and compounded issues around social exclusion/inclusion due to the visual indications of a disability (such as a white cane or a guide dog) combined with a built environment hostile and unwelcoming to people without strong vision. Aside from the physical barriers, people who are blind, Deafblind, or who have low vision also perpetually are at a disadvantage in mediated social situations. The increased difficulties of gathering visual information around them, from subtle interpersonal social cues to visually mediated messages can be disenfranchising, regardless of any individual’s levels of intelligence, wit, and charm.

In that vein, this chapter examines the potential for links between accessible media, such as audio-described media, and public health effects caused by social exclusion or inclusion. Designing for broad inclusion, including creating an appropriate balance between the needs of the few and the many, requires accessibility as its core. But such an approach also demands a state of equilibrium within the mediated context that feels welcoming to all, including participatory steps not too steep or foreboding for anyone. Accessibility, from that perspective, can be considered a basic and binary requirement, like an open door. Is the door open, yes or no? But media design also has an enormous service component to it that can vary greatly in quality but still not violate any state or federal laws. Even if allowed in the accessible door, in other words, what is inside waiting for you? Do people feel like they belong? Or does it feel like a hostile environment, continually trying to prod that person back outside? Such a topic could be approached from multiple angles and at various levels of abstraction to triangulate larger phenomena. From our scholar-practitioner paradigm, though, we wanted to keep our research grounded in everyday practices. To this end, we analyzed compositional approaches to descriptions. In other words, when sighted people described a piece of visual media for a person who cannot see it, what did they say, and

how did they say it, and how does that approach affect feelings of social inclusion/exclusion?

We did not seek a thick case-study examination of just a single description process, or even a project-level process; instead, we wanted to identify broader compositional approaches that could impact feelings of social inclusion/exclusion through an identification of their general characteristics and a conversion of those ideas into best practices. We think of that position in the process as the bridging moment, in which a describer has chosen to describe a specific piece of visual media, has picked the strategic perspective from which to describe the image and determined its aim. These tactics we have identified will allow the describer to carry out the work in ways that measurably improve social inclusion.

To identify these core compositional tactics, the authors hosted a hackathon-like "Descriptathon" that brought together more than 100 people from throughout the US and Canada in a three-day intensive workshop in February 2021 designed to audio describe print brochures of communally important public places (16 national parks). Those descriptions then were evaluated by people who are blind, Deafblind, or who have low vision using validated scales measuring aspects of Social Inclusion (Jason et al., 2015; McColl et al., 2001; Peterson et al., 2008). This chapter will present the results of that study and the identification and development of the Social Inclusion tactics and will convert these characteristics of socially inclusive description into best practices that can be used and tested in an effort to improve feelings of inclusion. (We also address our research in Oppegaard and Rabby, 2022.)

For our foundational research questions, we asked two questions:

RQ1: What characteristics of Audio Description do blind/visually impaired people identify as important?

RQ2: Does a relationship exist between effective Audio Description and social inclusion?

Audio Description as an Antidote to Overarching Ocularcentrism

Audio Description, as a research field and as a practice, primarily has been studied in relation to dynamic media, such as television, theater, and opera,

all fo
in ter
the n
includ
happy
area c
includ
etc.—
extens
system

a stra
needs
it, thr
skill, v
ucts. A
empiri
Descri
media
access,
underr
nation:
low vis
Broadc
al., 202
suppor

E
roughly
only in
of book
as the b
2016; K
& Oren
and dev
which a
heritage
Park Se
ing tim
lowers l

all forms that put severe time constraints on what can or cannot be done, in terms of the description. Mostly, description in dynamic media fits in the narrow gaps between dialogue, leaving little room for introspection, inclusiveness, or rich public dialogue. In that context, listeners usually are happy with whatever visual information they can get audibly. But in the area of Audio Description we are most concerned about—"static" media, including photographs, illustrations, collages, charts, timelines, maps, etc.—much still needs to be studied and learned about description that can extend to virtually unlimited lengths, with digital media and distribution systems, unrestrained by time.

Audio Description is a rich interpretive and descriptive activity, not a straightforward transcription service. It also is a learned skill, which needs improved educational materials and more training programs about it, through which people can practice describing and get better at this skill, while researchers iteratively circle around the processes and products. Access to these evolving educational materials, refined by associated empirical studies of them, creates a realistic path to improving Audio Description in a holistic manner. As a technique for translating visual media into audible media and as a way to offer equivalent experiential access, Audio Description already has been widely accepted by this underrepresented community as a primary solution, including by several national associations of people who are blind or Deafblind or who have low vision (e.g., Accessible Media Inc. and The Canadian Association of Broadcasters, 2015; American Council of the Blind, 2022; Hutchinson et al., 2020; Rai et al., 2010). It clearly needs more attention, broader public support, and use, though, to reach its potential.

Even though Audio Description has been studied by academics for roughly four decades, it has grown rapidly as an area of scholarly interest only in the past few years, including through the publishing of a first wave of book-length manuscripts and the creation of dedicated conferences, such as the biennial Advanced Research Seminar on Audio Description (Fryer, 2016; Koirala & Oppegaard, 2022; Maszerowska et al., 2014; Matamala & Orero, 2016). Meanwhile, the U.S. National Park Service has collected and developed research initiatives around "Healthy Parks, Healthy People," which attempts to quantify and qualify the public-health impacts of its heritage sites as cornerstones of American health and wellbeing (National Park Service, 2020). Some of that research includes evidence that spending time in nature is associated with good health (White et al., 2019); lowers levels of stress, depression, and anxiety (Bratman et al., 2015; Cox

et al., 2017; Haluza et al., 2014); and socially equalizes health disparities (Lachowycz & Jones, 2014; Mitchell & Popham, 2008; Wolch et al., 2014).

Meanwhile, an extensive and complicated debate about disability rhetoric intersects with multiple areas of technical communication, which is beyond the scope of this chapter. In summary, though, people who are blind typically are socialized in ways that establish and reinforce their exclusion from society, regardless of the will or skill of the person, and assumptions that people who are blind are “helpless, docile, dependent, or incapacitated” tend to lead those who even subconsciously hold those views, including designers, to create exclusionary and perpetuating media systems that deny a person with low vision, Deafblindness, or blindness any opportunity to attain independence or societal achievements (Scott, 1969, p. 17). Social exclusion is a contested term as well, with many facets, and settling that terminology debate is beyond the scope of this chapter. For our purposes here, we define social exclusion along the lines of van Bergen et al. (2017, p. 257), as socioeconomic inequalities associated with multiple dimensions, such as “limited social participation,” “material deprivation,” “inadequate access to basic social rights,” and “lack of normative integration.” Such social exclusion causes significant secondary health risks that include anxiety, depression, and chronic pain (Kim et al., 2016; Wilber et al., 2002).

Media Design Picks Winners and Losers

Consider the time, energy, and resources involved in simply designing a corporate logo. For example, Google (one of our research project’s supporters) initiated intense international debates about typefaces, colors, and graphics (Zjawinski, 2008). But to anyone with a screen reader as their interface, the Google logo is almost invisible. In the alt-text, picked up by screen readers, the logo is represented by just a single word: “Google.” As of this writing, that alt-text says nothing more to the billions of people who use the page every day, not what typeface was chosen, what colors the letters are, what size the font is, not even “Google logo,” and that is the embedded information directly available on the company’s ubiquitous web-search webpage about this carefully crafted paragon of graphic design for people who cannot see it.

As an extended thought experiment, recollect the media designs in your life that do not privilege sight above all and instead might equally

emph
long
and
Visua
soun
belov
typic
an at
the p
featu
to us
song:

sensc
exam
restr
reflec
regar
orgar
chan
feel i
old s
system
in ex
behir
fully
pred
choic
migh
prod
acces
plent
the r
comp
But i

what
our r
more

emphasize sound, touch, taste, or smell. That probably did not take you long to list, because taste or smell interfaces are almost non-existent, and touch typically is a complementary interface, not a primary one. Visual interfaces clearly are the dominant apex interfaces, so that leaves sound-oriented interfaces in a secondary or niche role. But how far below sight is sound in media design? Even radio or podcast interfaces typically require users to navigate visual radio or podcast screens before an audience member can listen. Even Alexa or Google Home devices, the possible harbingers of the audible interfaces of the future, have visual features and buttons that provide key controls, and they can be difficult to use anyway for any complex commands beyond getting them to play songs or answer trivia questions.

Where do the media designs that offer a balanced and redundant sensory mix exist? Again, you might have trouble coming up with many examples. This is not building an argument to regulate or diminish or restrict visual media in any way. This argument provides a chance to reflect, and a challenge to imagine media designs that include everyone, regardless of their abilities, to gather data through any particular sensory organ. By not favoring one sense over any other and giving more senses a chance to collect data at equivalent scales, more people inherently would feel included by the diversity of options to gather the information. Yet old sight-privileging design habits are hard to break. They pervade new systems that simultaneously increase media use and exclusionary designs in exponential fashion without concern or addressing those left further behind by these choices. Just as not all media should be fully audible or fully tactile, to flip the situation over, not all media should be processed predominately through the eyes without understanding how such design choices favor some people and disenfranchise others. Although designers might have been able to make the case, at least in the analog world, that production and dissemination options were too limited to make such accessible media, digital-media designers, producers, and creators have plenty of options now. Accessible design might require more time in the media workshop, additional planning and resources, and potentially compromises for sighted audiences, which are the dominant consumers. But it could happen if the will exists to include everyone.

This chapter's primary provocation, therefore, is not about restricting what can be seen but instead challenges how our media combined with our many senses conjure ideas and images in our minds and could include more people in those processes. If you have ever listened to a great radio

program or podcast, you can imagine how powerful audible media can be and that it can rival the information richness provided by visual media. Pragmatically, though, it is easier for media designers to package and sell a photo or a video than to capitalize on a piece of audio, with no visuals, which aligns capitalism with visual media production and consumption and helps to explain its dominance in the global media economy and ecology.

Yet even if the only focus of media design is on pure capitalistic domination—and all legal, ethical, and moral obligations are disregarded—major economic incentives still exist for creating more-accessible media en masse. In just raw numbers, and focused only on visual acuity, about 27 million, or roughly 10% of, Americans have a visual impairment (American Foundation for the Blind, 2020). During the next three decades, the population of adults with vision impairment and age-related eye diseases is expected to double, because of the rapidly aging U.S. population (Centers for Disease Control, 2020). In addition to impediments that visual impairments cause for many everyday activities—such as reading, watching television, driving, cooking, cleaning, paying bills—blindness and low vision also affect many important public interactions and have been medically linked to increases in stress and illnesses, plus higher levels of premature deaths (Centers for Disease Control and Prevention, 2020).

In other words, people who are blind or Deafblind or who have low vision want to experience a full life, too. They want to feel included. They have families and friends, associates and colleagues, rivals and competitors, etc., who are sighted and who have access to all of this rapidly circulating information. Such an accessibility divide—based only on visual acuity—creates a fractured society as well as multiple health issues for people who are blind or Deafblind or who have low vision. Media designers can address this issue directly, if they just make more-accessible media a priority.

From a National Legacy of Exclusion to Inclusion

As a country founded during the rise of visual media, the US has a long history of excluding and mistreating people with disabilities, including people who are blind or Deafblind or who have low vision (Mitra et al., 2019). Questions about such treatment, related to the public health of people with disabilities, have been gaining scholarly interest across disciplines, but disciplinary-bounded approaches to the topic so far often

have b
(Krah
discip
people
noise.
ized p
homog
apeuti
In the
built r
a met
enviro
the de
sion ir
chapte
public
Deafbl
context
accessi

timod
consid
it wou
roughl
its pur
Park to
conten
can be

operati
more t
stewar
2022).
preserv
via inte
other c
place.
also of
has bec

have been at abstract and theoretical levels rather than at the ground level (Krahn et al., 2015). As a growing chorus of unified voices, transcending disciplines, some scholars have chosen to focus on specific contexts and people with specific physical impairments as a way to cut through the noise. This precision-medicine approach—which aims to adapt generalized programs, such as treating all people with varying “disabilities” as a homogenous group—has been compartmentalized into customized therapeutic options that account for lifestyle commonalities (Sabatello, 2018). In the Social Model of Disability (Shakespeare, 2006), which stresses the built nature of most contemporary environments, Audio Description is a method of recognizing those inequitable structures and adapting the environment to make it more inclusive. Health, meanwhile, is affected by the degree to which persons with disabilities enjoy full rights and inclusion in a society (Mitra et al., 2019). Following such scholarly flows, this chapter gets grounded in its places, national parks representing prominent public resources, and its research participants, people who are blind or Deafblind or who have low vision, to impact social inclusion in those contexts with those people in ways that can increase precision in media accessibility in general.

As a primary example of how widespread opportunities for multimodal or even audio-oriented media could radically reshape society, consider the prominent public resources that are national parks and what it would mean to the country’s psyche if all citizens could enjoy them in roughly equal ways. Much of the allure of a national park, meanwhile, is its pure visual spectacle, from the Statue of Liberty to Yellowstone National Park to the Grand Canyon. Visual media about these places carries rich content, too, but without the accompanying audible equivalents, much can be lost by those who cannot see them.

American taxpayers contribute almost \$3 billion annually for the operations of these publicly funded places that help to communally protect more than 400 culturally significant sites throughout the country, and that stewardship is philosophically intended for everyone’s benefit (Repanshek, 2022). U.S. National Park Service sites address conservation of wildlife and preservation of landscapes and also what these places mean to Americans, via interpretive storytelling, complemented by artifacts, performances, and other aspects of the built environment meant to convey the story of the place. These sites are considered of at least national interest but sometimes also of irreplaceable international importance. The National Park Service has become a worldwide leader in accessibility initiatives of all sorts.

When family members and friends want to do something enjoyable together at a national park, a person who is blind still may feel excluded because of the lack of visual access to much of the cultural media about the place, including brochures, wall texts, trail markers, exhibits, maps, signs, and any other number of visual cues, as well as any viewpoints that typically are not audio described. These parks, even as some of the most accessible public places in the world, can compound feelings of exclusion. Such feelings can be projected as being spread exponentially by the visually oriented media at all of the world's other gathering places, such as national wildlife refuges and forests, botanical gardens, museums, zoos and aquariums, plus nonprofit and for-profit attractions that are aimed at attracting the general public but are functionally inaccessible to a person who cannot see or see well. Expand that sphere of exclusion to include regional, state, and local points of interest—if those places are fully or partially inaccessible for people who are blind or Deafblind or who have low vision, the individual and their family and friends have to make tough decisions about their time together that often offer no great alternatives, like the coffee shop analogy earlier: Do they go together to these places anyway and risk that the person who cannot see or see well will have a frustrating time; do they go somewhere else that might be more accessible, if such a place exists; or do they leave their family member or friend out altogether?

Such social-exclusion problems, though, mostly are self-evident. Thus, our focus here is not on belaboring the idea that there are social-exclusion problems for people who are blind or Deafblind or who have low vision. Instead, we take this pragmatic approach: *A dearth of descriptions in public places exists, resulting in a woeful need for more.*

In addition to the need for quantity, Audio Description has important qualitative aspects and under-researched mental and physical health impacts. Audio Description offers a systemic approach to improving social inclusivity for people who are blind or Deafblind or who have low vision in ways similar to what widespread captioning has achieved in the past few decades for people who are deaf or hard of hearing. Its unique usefulness to people who are blind creates a latent need for research into its potential for health benefits. We propose that Audio Description can affect perceptions of social inclusion and that this social inclusion perception can affect mental and physical health. But we also want to know how: in what ways and to what effects? Social exclusion, for example, has been linked to damaging secondary medical conditions, such as anxiety, depression, and

chroni
a start
in put
of peo

This s
includi
or who
org) b
audio
distinc
Descri
increa
the ex
proces
Review

staff, v
vision
the be
their t
or who

losing
Everyc
feedba
details
Oppeg
results

I
9-11, 2
joined
16 tear
created
presen
by 22

chronic pain (Castro et al., 2018; Kim et al., 2016; Wilber et al., 2002). As a start, we wondered if we could improve in any material ways inclusivity in public places and increase feelings of social inclusion and the health of people who are blind or visually impaired through Audio Description.

Method and Results

This study is part of a long-term research project aimed at improving inclusive content in national parks for people who are blind or Deafblind or who have low vision. The UniDescription Project (www.unidescription.org) began as a grant-funded initiative in fall 2014 with the objective of audio describing 40 U.S. National Park Service's Unigrid brochures (the distinctive black brochures featured at National Parks in the US). The Descriptathon evolved from these initial practical concerns as a way to increase motivation and engagement in participants as well as to make the experience more enjoyable for those involved. These data-collection processes were approved in advance by the lead author's Institutional Review Board as well as by the U.S. Office of Management and Budget.

A Descriptathon comprises a multi-day event when teams of site staff, volunteers, and people who are blind or Deafblind or who have low vision compete together in a March-Madness-style competition to write the best possible Audio Descriptions in the time allotted. Besides helping their teams write the descriptions, participants who are blind or Deafblind or who have low vision also serve as judges of the descriptions.

Winning teams advance in the friendly competition bracket, while losing teams have opportunities to participate in consolation rounds. Everyone gets to continue describing, and judges continue to provide feedback throughout the event, regardless of who wins or loses. More details about the Descriptathon and its development can be found in Oppegaard (2020) and on the Descriptathon website. Figure 9.1 shows the results of Descriptathon 7 as a visualization of the friendly competition.

Data from this study emanated from Descriptathon 7, held February 9–11, 2021. In terms of participants, 119 sighted and non-sighted people joined the workshop from throughout the US and Canada, grouped into 16 teams, which ranged from 5 to 10 people on each team. These teams created Audio Descriptions for multiple national parks brochures and presented them to be judged. These descriptions were then evaluated by 22 blind and visually impaired judges. This process generated 122



Figure 9.1. Descriptathon 7 Final Results. *Source:* Created by the author.

qualitative responses. The judges decided among the pairings who wrote the description better, and, as a part of their process, they explained why they preferred one description more than the other. These descriptions provided the empirical data for clues of characteristics of effective audio description (and consequently promote social inclusion). This also helped to ensure their inclusion in this process.

Using this feedback from judges, we took a grounded-theory approach (Glaser & Strauss, 2017) to open-code these statements, clustered them into themes, and then analyzed the themes. Eventually, due to the thematic clusters that emerged, the data were parsed into five broader labels plus an “other” characteristic, reserved for statements that did not meet one of these themes.

Specifically, the first research question involved identifying the characteristics of effective Audio Description—in other words, what should people strive for when writing Audio Description? Using the remarks judges made about why they selected a particular description, a list of common

themes were reviewed and emerged into large categories. After a person completed this stage, the position seemed to work in a way that

As a result, the varied responses received did not seem to have had a clear statement. Some responses were more detailed. Furthermore, that with his or her coders (0.71). We remain

RQ1: C. THAT B

The code categories to round all of labels

themes was derived from the data and was recorded. The second author reviewed the statements multiple times, deriving key characteristics that emerged from the data (Creswell, 2015). These terms were then grouped into larger themes, reviewed, and recorded as the first draft of the typology. After several revisions and refinements, a second coder (also a blind person) unfamiliar with the typology was brought in and trained. Upon completion of this phase, modifications to the typology were made, and, in some cases, distinctions between the codes were clarified. Through this, the final codebook emerged. Having a blind person involved at this stage helped the inclusivity of our research and enabled an insider positionality to emerge as the categories evolved. When the two coders seemed to agree on what each category constituted, they proceeded to work independently for reliability.

A statement comprised one unit, as each one involved the judge invoking why they selected that description in that round. Given the varied and often detailed nature of some of the comments, several units received more than one code. Of the 121 statements coded (six winners did not share reasons and thus did not receive a code), 105 had one code, 12 had two codes, 3 had three codes, and 1 had four codes. If a statement had a clear preference, or one dominant reason, then that was the code. Statements received two or more code in cases for which multiple reasons were indicated: e.g., This was a difficult choice, as both descriptions were very similar. However, I preferred this description, because he had more details about the face of the person such as the nose and the lips. Furthermore, this description suggested regarding the person's sex/gender, that without putting an emphasis on it, which allows the listener to make his or her own judgment. A final pass of 30 of the statements by both coders resulted in 33 codes, with a reliability of 78.6% (Cohen's Kappa=0.71). With strong reliability established, the second coder completed the remaining statements.

RQ1: CATEGORIZING CHARACTERISTICS OF AUDIO DESCRIPTION THAT BLIND/VISUALLY IMPAIRED PEOPLE IDENTIFY AS IMPORTANT

The coding typology consisted of five major categories plus an *Other*. The *Other* comments noted something not encompassed by the five major categories but were worth noting. For example, this statement from the four round about Ash Meadows National Wildlife Refuge indicated specificity of labels: "It is difficult to try to describe a collage like this and convey

meaning along with labels. I think Ash Meadows did a nice job of not only listing labels, but also giving me a sense of predators and prey, plants and reapers." On other occasions, a judge would indicate something non-descript: e.g., they thought it was "better." In total, 17 comments received an *Other* code.

Given that, to our knowledge, delineation of specific factors for what makes Audio Description effective has not been done before, these preferences merit further illustration before continuing. The five major categories, in order of most to least coded, were *Detailed* (coded 55 times), *Organization* (31), *Quality* (14), *Objective* (13), and *Concise* (12) (see Table 9.1).

Detailed (D)—For comments deemed as *Detailed*, the judges indicated that the description gave a sufficient sense of the image. The judges indicated this description gave the user the elements they wanted, without any further questions. The judges felt the descriptions gave them a sense of the contents of the image without overwhelming them. Although seemingly in contradiction to the category of concise, the two can work symbiotically—descriptions that give enough detail without wasting the user's time. Examples of comments coded as *Detailed* included, "I found the description slightly more detailed, and provided information regarding the individual's clothing and metals" and "Although they did not identify it as Death Valley their description was very good and detailed."

Organization (Org)—Descriptions with this code had a solid and recognizable writing structure, which followed a certain logic. It focused

Table 9.1. Audio Description Characteristics and their Definitions

Characteristic	Definition
Detailed	The description had sufficient detail
Highly Organized	The description had a logical, clear, and easy-to-follow organization, particularly crucial for maps
Quality	The description was well-written
Objective	The description was written from a detached and objective position
Concise	The description did not contain extraneous information

Source: Created by the author.

specifically
the organi
the logical
the image,
effort. Jud,
compreher
the descrip
such as sta
nized state
was featur
other desc
person," an
about the

Qual
caliber of
polish, ski
quality wa
frequently
of comme
"I felt the

Obje
comments
tive. Sever
sound loa
politics an
objective c
or making
with stron

Con
they felt tl
use overly
sentences
gloss over
seems part
concisene
were chose
and "Goo
my mind.

specifically on organization/layout description and could also refer to the organization of information within the app. Frequently, judges noted the logical layout, the ease that the description allowed them to picture the image, and the ability to logically visualize something without much effort. Judges indicated the helpfulness of properly orienting the user to comprehend the image easily. Sometimes the image involved a path, and the description used that to orient the user. Others used logical patterns, such as starting at the top left and moving clockwise. Examples of organized statements included, "The description of the person in the photo was featured more prominently in the beginning of the description. The other description had me waiting until the end for a description of the person," and "This description gave me very clearly all of the information about the map, what was there and what could be enjoyed."

Quality (Q)—Descriptions coded as *Quality* focused on the perceived caliber of the writing. Judges noted a description was written well with polish, skill, and flair. The execution and establishment of what constituted quality was perhaps largely based on the judge's opinion, but it came up frequently enough as a reason that a judge selected a statement. Examples of comments coded as *Quality* included, "I liked the wording better" and "I felt the description was clearer and more engaging."

Objective (Ob)—Descriptions coded as *Objective* based on the judge's comments were written from a detached, objective, and neutral perspective. Several times, the judges commented that the descriptions did not sound loaded or "politically correct." Essentially, the descriptions skirted politics and notations of division in the minds of the judges. Examples of objective comments included, "very informative, without going overboard or making assumptions" and "Good neutral description of gender features with strong explanation of accessories."

Concise (Con)—Items coded as *Concise* gave judges the information they felt they needed, with nothing extraneous. The descriptions did not use overly flowery language, nor did they get bogged down in overlong sentences and phrases. Given that in Audio Descriptions, the user cannot gloss over things in a way that one could in reading visually, conciseness seems particularly pertinent. Comments about descriptions that highlighted conciseness included, "Both descriptions were to the point and the words were chosen Wisely [sic] and well. I could really get a view of this portrait" and "Good description with enough details to allow me to picture it in my mind. Didn't get caught up in a lot of unnecessary details."

RQ2: PUTTING AUDIO DESCRIPTION CHARACTERISTICS TO THE SOCIAL-INCLUSION TEST

The second research question examined the connection between social inclusion and the five identified characteristics. As noted earlier, one of the goals and potential benefits of high-quality Audio Description is to create higher levels of connectedness. The social connection variables consisted of three items derived from Peterson et al. (2008), rated on a 1–7 scale: “I feel connected to this place,” “This place helps me fulfill my needs,” and “I feel like I can get what I need in this place” ($\alpha=.89$, $M=4.84$, $SD=1.19$).

When comparing the Audio Description “winners” the judges chose in contrast to the non-winners, the preferred Audio Descriptions rated higher on our social inclusion measure. An independent groups *t* test revealed judges rated the winners ($M=5.32$, $SD=1.11$) significantly higher than the non-winners: ($M=4.61$, $SD=1.19$), $t(314)=4.51$, $p < .001$, $d=.51$. These findings suggest the connection between quality Audio Description and feelings of social inclusion exist and are positively related (see Table 9.2).

Further examination of the data revealed which specific characteristics had higher social inclusion means. Table 9.2 displays the differences in the means, with *Concise* having the highest mean on social inclusion (5.56) and *Objective* having the lowest (4.98). When comparing the social inclusion means of an Audio Description with a particular characteristic against one without that characteristic (e.g., descriptions identified as objective vs. those that were not), a series of *t* tests revealed only one characteristic, *Concise*, with a significant difference: $M=5.56$, $SD=0.81$ vs. $M=4.81$, $SD=1.20$, $t(314)=2.12$, $p < .05$, $d=.62$.

Table 9.2. Audio Description Characteristics with Social Inclusion Means

Audio Description Characteristic	Social Inclusion Mean
Detailed (n=54)	5.12
Concise (n=12)	5.56
Organization (n=30)	5.23
Quality (n=14)	5.29
Objective (n=13)	4.98

Source: Created by the author.

Discussion

This research is novel in the area of Audio Description, not only because of its grounding in the Descriptathon context but also because this research includes social-inclusion values. It represents an important foundational step in improving descriptions and the experiences of the people who use them, as well as addressing the public health concerns associated with social exclusion. At least two key points from the present study merit further attention. We offer some tentative best practices for writing quality Audio Description based on this initial research, and the combination of these findings and analysis could be beneficial in many contexts, including within classrooms teaching common technical communication topics such as document design, media accessibility, and communicative aspects of social justice. In those ways, this chapter could serve as a primer for larger issues in this area or as a guide, in practical contexts, for creating better description overall.

At a theoretical level, we make a case here for a new approach to Audio Description research, one that aims at mid-level on the ladder of abstraction, to identify broad areas of common concern among targeted audiences and also to establish conceptual ground above the specifics of any individual description but below the line that argues that *all* description is good and helpful. We contend that there is more to Audio Description than quantity, and if quality is at stake, then how do we measure and improve it? At the most practical level, for example, designers could use this research to create concrete checks on the quality of their descriptions by simply asking Deafblind, blind, and low-vision listeners, "Is this description detailed enough for you?" "Is it well organized?" "Is it of high quality?" and so on, adding to the end of each yes-or-no question and "Why?" to generate a helpful heuristic measure of how the descriptions are performing for their targeted audiences.

The evidence indicates a connection to well-composed Audio Description and social inclusion. Access to opportunities is a key component of social inclusion (Oveido-Caceres et al., 2021), and creating effective Audio Descriptions provides one avenue for this. For all of the negatives of technology, perhaps the greatest positive potential involves its ability to connect people. The COVID-19 pandemic would have been much worse without the Internet to provide the vital means to keep people connected to their jobs, their families, and their community. By this same token, the

use of technology to supplement and equalize experiences presents a fruitful vein to tap. It is important to design and supplement with intentionality to include people of all abilities (Chang et al., 2022).

The importance of intentional design for visual impairments as a means of inclusion has received support, such as Siu's (2011) case study covering public toilets. Baldarelli and Cardillo (2022) examined a tactile museum, designed to provide people with different abilities the chance to have a similar experience as a means of social inclusion. The effective use of technology (in the present case, the use of Audio Descriptions) can connect people to places unlike the tactile museum (which is specifically designed that way), such as national parks. And not all attempts to be inclusive are effective; interventions do not always have a clear and unitary impact. Candlin (2003), in a study concerning blind people's experiences in art museums, noted the difficulties of separate interventions to offer instruction and experiences specifically for blind people. She found a bifurcated set of opinions among her interviewees—either people felt included through a special event for visually impaired people, or they felt the experience “dreadful,” as if they were singled out (made to feel separate from others).

The challenge exists to maintain social inclusion through effective Audio Descriptions without pulling people into a completely separate experience, which leads to the second key finding—the key characteristics of effective Audio Description. This is the first time in our knowledge of a typology of this sort that has been identified through empirical testing. If the goal is to improve Audio Description, a key step is to listen to the people who use them. The authors took the opinions of blind and visually impaired people to derive the typology and then involved another member of that community to construct its final version.

The findings now lead us to some age-old issues. For example, what is the balance between enough detail while staying concise? Both of these emerged in different ways in this study. For example, judges whose reactions were coded as *Concise* reported the highest level of social inclusion (.3 higher than the next closest mean). However, *Concise* was also identified the least number of times by the judges, emerging in only 12 of the comments (versus *Detailed*, which emerged in 54). This indicates that when it mattered, it really mattered.

Given the relative newness of this genre and its likely increasing importance, further refinement of what these characteristics may entail

merits stu
own uniqu
Audio De
present st
process.

BEST PRA

A primar
simultane
not see it
public pl
supportec
public pl
to start, a
Pragmati
positive i
to create,
making t

The
importar
look for
create em
this stud
to keep i

Experim Descript.

The rauc
in Journ
that tern
critique
Audio D
al-critica
can be s
outside
or cultu

merits study. If we take the approach that specific mediums have their own unique standards (e.g., Hayles, 2004), it holds that developing effective Audio Description requires a unique set of rules and best practices. The present study represents an important first step in this boundary-defining process.

BEST PRACTICES

A primary goal of Audio Description is to equilibrate visual media and simultaneously transform it into something useful for people who cannot see it. At a strategic level, we are researching primarily at prominent public places because these sites, including national parks, are publicly supported and citizens invest in them for the good of all. Working on public places and making those fully accessible presents a logical place to start, and then we can use them as models for the rest of built society. Pragmatically, as a part of our results, we want our research to have a positive impact on the Audio Description community, including helping to create, share, and model accessible media products and processes for making those products.

The present study represents a step in this direction—a first, but important one. Using the goals identified in the judges' preferences, we look for opportunities in operational procedures where our research can create empirically sound arguments for novel best practices. In the case of this study, we recommend five best practices. Specifically, these are goals to keep in mind when writing Audio Descriptions.

Experimental Best Practice for Better Social Inclusion 1: Description should be fact-based about what can be seen

The raucous debates over the term *Objectivity* have been well-chronicled in Journalism Studies, so there's no reason for Audio Description to use that term and repeat the mistakes made in another field. Scholars in art critique both what's inside the visual media frame and what's left out, but Audio Description is culturally considered a descriptive art, not a cultural-critical one. We recommend that describers generally focus on what can be seen in the visual media, including direct visual hints about what's outside the frame. But they should avoid tangents beyond that, historical or cultural, unless adding that context helps in the conceptualization of

what is being shown to the viewer. More importantly, from this “Objective” perspective, describers should avoid any triggering words or phrases that can lead to inadvertent distractions based on the describer’s political, philosophical, or moral positioning. (This specific concern appeared several times in the comments.)

*Experimental Best Practice for Better Social Inclusion 2:
Description should be well-organized*

Think about description organization this way: This description is the primary interface to the public place for people who are blind or Deafblind or who have low vision. When they perceive an organizational mess in the description about the place, the site might just as equivalently (for sighted visitors) leave an impression of dirt streaks on the front door and trash bags throughout the lobby. Disorganization can be interpreted as a sign of poor management or a lack of care for the visitor. Either way, disorganization will make the listener feel unimportant, unwanted, and socially outcast.

*Experimental Best Practice for Better Social Inclusion 3:
Description should be detailed*

Although some people on occasion want just a quick description of a sentence or two, to get the general idea of what the visual media shows, a much more common request for describers, in our experience, is to provide more details. This best practice generally contradicts the predominant alt-text culture of, say, providing a single line of text to describe any photograph. With its contradictory position to the dominant ideology, the idea needs more investigation to understand its nuances. But alt-text originally was a technological constraint, not an empirically tested best practice for description composition. This finding leads us to recommend detailed descriptions with a caveat, that they also are both well-organized and concise (see also Best Practices 2 and 4). Brevity for the sake of brevity, we have found in this research and in other studies, is not necessarily desirable in descriptions as an overriding characteristic. Neither is detail just for the sake of detail. We hypothesize that lack of detail could lead to perceptions of the listener feeling unimportant or not getting good service, although we did not test perceptions at those detailed levels. The aim here is that the describer provides enough details, so all major questions have been answered, but

not too much, so the description feels bogged down by extraneous scraps of information. The challenge for now is that the right amount will need to be determined on a case-by-case basis through a localization process.

*Experimental Best Practice for Better Social Inclusion 4:
Description should be concise*

Concision seems interwoven with other best practices that relate to details and organization, but similar to Best Practice 3, Best Practice 4 likely refers to the “Goldilocks” principle of listeners wanting the amount of information that is “just right,” instead of too little or too much. The comments in this coded cluster lead us to hypothesize that arbitrary lengths or word counts should not constrain descriptions, but a good editor should. Admittedly, this is one of the toughest dialectics in writing to manage in Audio Description and all types of writing, technical and otherwise.

*Experimental Best Practice for Better Social Inclusion 5:
Description should be created with a writerly quality*

Because Audio Description is generally scripted in advance and describers have ample time to consider what they are going to say and how they are going to say it, listeners expect a professional quality to the descriptions. They appreciate writerly flourishes, with active verbs and descriptive nouns and adjectives leading to poetic phrasing. When the listener feels the care and concern of the writer, then the listener is likely to feel more valuable and more included. Again, in opposition to most alt-text guidelines, thoughtful and considered writing matters here.

Conclusion

The field of Audio Description is new, but growing. Through identifying and describing five major characteristics for Audio Description—*Detailed, Highly Organized, Quality, Objective, and Concise*—and converting them into Trial Best Practices that connect them to social inclusion, this chapter opens fertile ground for further investigations into the efficacy of Audio Description to make people who cannot see or see well feel valued and important to public places, potentially increasing feelings of social inclusion, while also make the places more accessible for everyone.

References

- Accessible Media Inc. and The Canadian Association of Broadcasters. (2015, June). *Post production described video best practices*. https://www.ami.ca/sites/default/files/2020-07/PP_Described_Video_Best_Practices_0.pdf
- Agboka, G. Y. (2013). Participatory localization: A social justice approach to navigating unenfranchised/disenfranchised cultural sites. *Technical Communication Quarterly*, 22(1), 28–49.
- American Council of the Blind. (2022, May 15). *The Audio Description project*. <https://www.acb.org/adp>
- American Foundation for the Blind. (2022, May 15). *Statistical snapshots from the American Foundation for the Blind*. <https://www.afb.org/research-and-initiatives/statistics>
- Baldarelli, M.-G., & Cardillo, E. (2022). Managerial paths, social inclusion, and NBS in tactile cultural products: Theory and practice. *Journal of Hospitality & Tourism Research*, 46(3), 544–582. <https://doi.org/10.1177/1096348020944440>
- Bratman, G. N., Hamilton, J. P., Hahn, K. S., Daily, G. C., & Gross, J. J. (2015). Nature experience reduces rumination and subgenual prefrontal cortex activation. In *Proceedings of the National Academy of Sciences*, 112(28), 8567–8572. <https://doi.org/10.1073/pnas.1510459112>
- Candlin, F. (2003). Blindness, art and exclusion in museums and galleries. *International Journal of Art & Design Education*, 22(1), 100–110.
- Castro, O., Ng, K., Novoradovskaya, E., Bosselut, G., & Hassandra, M. (2018). A scoping review on interventions to promote physical activity among adults with disabilities. *Disability and Health Journal*, 11(2), 174–183.
- Centers for Disease Control and Prevention. (2022, May 15). *The Burden of Vision Loss*. https://www.cdc.gov/visionhealth/basic_information/vision_loss_burden.htm
- Chang, I., Castillo, J., & Montes, H. (2022). Technology-based social innovation: Smart city inclusive system for hearing impairment and visual disability citizens. *Sensors*, 22(3), 848. <https://doi.org/10.3390/s22030848>
- Comolli, J. L. (1980). Machines of the visible. In T. de Lauretis & S. Heath (Eds.), *The cinematic apparatus* (pp. 121–142). Palgrave Macmillan.
- Cox, D. T. C., Shanahan, D. F., Hudson, H. L., Fuller, R. A., Anderson, K., Hancock, S., & Gaston, K. J. (2017). Doses of nearby nature simultaneously associated with multiple health benefits. *International Journal of Environmental Research and Public Health*, 14(2). <https://doi.org/10.3390/ijerph14020172>
- Creswell, J. W. (2015). *30 essential skills for the qualitative researcher*. Sage.
- Dolmage, J. T. (2014). *Disability rhetoric*. Syracuse University Press.
- Fryer, L. (2016). *An introduction to Audio Description: A practical guide*. Routledge.
- Getto, G., & Sun, H. (2017). Localizing user experience: Strategies, practices, and techniques for culturally sensitive design. *Technical Communication*, 64(2), 89–94.

Gonzales
Tec
Haluzá, I
lic
out
He
Hayles, K
anc
Hutchins
htt
Jason, L.
che
43(
Kim, K.,
dis
org
Koirala, S
ap,
its
1-
Krahn, C
as
He
Lachowy
ac
9-
Maszero
Ne
Matamal
Meadow
Melonço
co
McColl,
co
Ar
do
Mitchell,
he
16
Mitra, M
he
ha
Mirzoeff

- Gonzales, L., & Zantjer, R. (2015). Translation as a user-localization practice. *Technical Communication*, 62(4), 271–284.
- Haluza, D., Schönbauer, R., & Cervinka, R. (2014). Green perspectives for public health: A narrative review on the physiological effects of experiencing outdoor nature. *International Journal of Environmental Research and Public Health*, 11 (5), 5445–5461. <https://doi.org/10.3390/ijerph110505445>
- Hayles, K. H. (2004). Print is flat, code is deep: The importance of media-specific analysis. *Poetics Today*, 25(1), 67–90.
- Hutchinson, R., Thompson, H., & Cock, M. (2020). *Describing diversity*. VocalEyes. https://vocaleyes.co.uk/?request_file=14091
- Jason, L. A., Stevens, E., & Ram, D. (2015). Development of a three-factor psychological sense of community scale. *Journal of Community Psychology*, 43(8), 973–985. <https://doi.org/10.1002/jcop.21726>
- Kim, K., Kim, D., Shin, Y., & Chul Yoo, D. (2016). Social exclusion of people with disabilities in Korea. *Social Indicators Research*, 129(2), 761–773. <https://doi.org/10.1007/s11205-015-1123-2>
- Koirala, S., & Oppegaard, B. (2022). The light bulb went on: A historiography-based approach to disentangling Audio Description's influential U.S. roots from its common practices. *Journal of Visual Impairment & Blindness*, 116(4), 1–12. <https://doi.org/10.1177/0145482X221116903>
- Krahn, G., Walker, D., & Correa-De-Araujo, R. (2015). Persons with disabilities as an unrecognized health disparity population. *American Journal of Public Health*, 105(S2), S198–S206. <https://doi.org/10.2105/AJPH.2014.302182>
- Lachowycz, K., & Jones, A. P. (2014). Does walking explain associations between access to greenspace and lower mortality? *Social Science & Medicine*, 107, 9–17.
- Maszerowska, A., Matamala, A., & Orero, P. (Eds.). (2014). *Audio Description: New perspectives illustrated*. John Benjamins Publishing Company.
- Matamala, A., & Orero, P. (2016). *Researching audio description*. Palgrave Macmillan.
- Meadows, M. S. (2002). *Pause & effect: The art of interactive narrative*. New Riders.
- Melonçon, L. (Ed.). (2013). *Rhetorical accessibility: At the intersection of technical communication and disability studies*. Routledge.
- McColl, M. A., Davies, D., Carlson, P., Johnston, J., & Minnes, P. (2001). The community integration measure: development and preliminary validation. *Archives of Physical Medicine and Rehabilitation*, 82(4), 429–434. <https://doi.org/10.1053/apmr.2001.22195>
- Mitchell, R., & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: An observational population study. *The Lancet*, 372(9650), 1655–1660. [https://doi.org/10.1016/S0140-6736\(08\)61689-X](https://doi.org/10.1016/S0140-6736(08)61689-X)
- Mitra, M., Long-Bellil, L., & Powell, R. (2019). Persons with disabilities and public health ethics. In A. C. Mastroianni, J. P. Kahn, & N. E. Kass (Eds.), *The Oxford handbook of public health ethics* (pp. 219–213). Oxford University Press.
- Mirzoeff, N. (2011). *The right to look*. Duke University Press.

- Mirzoeff, N. (2016). *How to see the world: An introduction to images, from self-portraits to selfies, maps to movies, and more*. Basic Books.
- Moore, K. R. (2017). The technical communicator as participant, facilitator, and designer in public engagement projects. *Technical Communication*, 64(3), 237–253.
- National Park Service. (2020). *Healthy parks, healthy people*. <https://www.nps.gov/orgs/1078/index.htm>
- Oppegaard, B. (2020). Unseeing solutions: From failures to feats through increasingly inclusive design. In J. Majewski, R. Marquis, N. Proctor, & B. Ziebarth (Eds.), *Inclusive digital interactives: Best practices, innovative experiments, and questions for research* (pp. 219–242). Access Smithsonian, The Institute for Human Centered Design, & Museweb.
- Oppegaard, B., & Rabby, M. K. (2022). Gamifying good deeds: User experience, agency, and values in play during a Descriptathon. *Technical Communication*, 69(4), 27–43.
- Oswal, S. K. (2013). Exploring accessibility as a potential area of research for technical communication: A modest proposal. *Communication Design Quarterly Review*, 1(4), 50–60.
- Peterson, N. A., Speer, P. W., & McMillan, D. W. (2008). Validation of a brief sense of community scale: Confirmation of the principal theory of sense of community. *Journal of Community Psychology*, 36(1), 61–73. <https://doi.org/10.1002/jcop.20217>
- Rai, S., Greening, J., & Petré, L. (2010). *A comparative study of audio description guidelines prevalent in different countries*. London: Media and Culture Department, Royal National Institute of Blind People (RNIB). <https://unidescription.org/storage/app/uploads/public/5f1/a3e/bb1/5f1a3ebb17896460620035.pdf>
- Repanshek, K. (2022, March 17). National Park Service got a small budget bump in FY22 funding package. *National Parks Traveler*. www.nationalparkstraveler.org/2022/03/national-park-service-got-small-budget-bump-fy22-funding-package
- Scott, R. (1969). *The making of blind men: A study of adult socialization*. Russell Sage Foundation.
- Sabatello, M. (2018). Precision medicine, health disparities, and ethics: The case for disability inclusion. *Genetics in Medicine*, 20(4), 397–399. <https://doi.org/10.1038/gim.2017.120>
- Shakespeare, T. (2006). The social model of disability. *The Disability Studies Reader*, 2, 197–204.
- Shivers-McNair, A. (2017). Localizing communities, goals, communication, and inclusion: A collaborative approach. *Technical Communication*, 64(2), 97–112.
- Siu, K. W. M. (2011). Designing public toilets to enhance the well-being of the visually impaired. *International Journal of Health, Wellness & Society*, 1(3), 137–145. <https://doi.org/10.18848/2156-8960/CGP/v01i03/41175>

Stat

Stat

Var

We

Wh

Wi

Wc

Zjc

- Statista. (2021, June 16). *Media usage in an internet minute as of August 2021*. <https://www.statista.com/statistics/195140/new-user-generated-content-uploaded-by-users-per-minute>
- Statista. (2020, April 4). *Hours of video uploaded to YouTube every minute as of February 2020*. <https://www.statista.com/statistics/259477/hours-of-video-uploaded-to-youtube-every-minute>
- Van Bergen, A. P., Hoff, S. J., Schreurs, H., van Loon, A., & van Hemert, A. M. (2017). Social exclusion index for health surveys (SEI-HS): A prospective nationwide study to extend and validate a multidimensional social exclusion questionnaire. *BMC Public Health, 17*(1), 253–266. <https://doi.org/10.1186/s12889-017-4175-1>
- Web Accessibility Initiative. (2020, May 15). Audio description of visual information. <https://www.w3.org/WAI/media/av/description/>
- White, M. P., Alcock, I., Grellier, J., Wheeler, B. W., Hartig, T., Warber, S. L., Bone, A., Depledge, M. H., & Fleming, L. E. (2019). Spending at least 120 minutes a week in nature is associated with good health and wellbeing. *Scientific Reports, 9*(1), 7730. <https://doi.org/10.1038/s41598-019-44097-3>
- Wilber, N., Mitra, M., Walker, D. K., & Allen, D. (2002). Disability as a public health issue: findings and reflections from the Massachusetts survey of secondary conditions. *The Milbank Quarterly, 80*(2), 393–421. <https://doi.org/10.1111/1468-0009.00009>
- Wolch, J. R., Byrne, J., & Newell, J. P. (2014). Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough.' *Landscape and Urban Planning, 125*, 234–244. <https://doi.org/10.1016/j.landurbplan.2014.01.017>
- Zjawinski, S. (2008, 12 March). How Google got its colorful logo. *Wired*. <https://www.wired.com/2008/03/gallery-google-logos>