Making Art Accessible to All: Co-Creating Multi-sensory Art with Visually Impaired People

by

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Images: courtesy of Anne Chick (2018). Improving intellectual access in temporary exhibitions for sight loss visitors through co-creation and co-assessment. *The Design Journal,* 21(4), 561–582. https://doi.org/10.1080/14606925.2018.1472441. Copyright 2018 by Taylor & Francis.

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Abstract

Blind and visually impaired people experience many limitations when encountering artworks, and most of the general public lack attention and understanding of the visually impaired community. Despite previous research efforts to make visual art more accessible to blind and visually impaired people through audio descriptions, tactile graphics, or digital media technologies, they still face challenges in experiencing art independently and feeling an emotional connection with artworks. This study explores how to create multi-sensory art for blind and visually impaired people to awaken a new form of experience. The study conducted semi-structured interviews to understand the experiences and perspectives of curators and blind artists on multi-sensory art. At the same time, by analyzing two case studies on co-creation with the visually impaired community, this study explores practices of involving the visually impaired community in the creative process. In addition, this study aims to investigate the potential of multi-sensory experiences to enhance the enjoyment and accessibility of art and culture for the visually impaired community. This study will broaden the knowledge about vulnerable communities by exploring the possibility of the visually impaired community as co-designers in multi-sensory art. This knowledge will benefit galleries, museums, and disabled communities and may lead to a positive reconsideration of the importance of an expanded sensory culture in our society.

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Chapter 1: Introduction

1.1 Introduction

Today's museums and galleries are not only platforms to preserve, collect and display artworks and artifacts, they have evolved into dynamic centers of learning, building community, interacting and even places of healing and contemplation (Levent & Pascual-Leone, 2014). In recent decades, museums and art galleries have continually innovated and updated traditional art experiences to explore new ways of representing arts and also to increase the wider public interest in artworks or exhibitions. In these efforts, issues of making art accessible for people with the visually impaired are often overlooked. According to the World Health Organization (2022), around 2.2 billion people globally have a vision impairment or blindness, and at least 1 billion people have vision impairments that could have been prevented or cured. In Canada alone, a study by Aljied et al. (2018) estimated that approximately 2 million people were experiencing sight loss. In the face of vast numbers of people with the visually impaired, museums and art institutions should be aware of the importance of including these individuals into their space and artworks.

However, in recent decades, visual art has dominated our culture, and visual arts are often assumed to be created and appreciated only through the sense of sight. Particularly in art institutions, the general public usually fails to recognize that blind and visually impaired individuals can enjoy art just as much as those with sight. Consequently, visually impaired people are often excluded from our highly visual world.

According to Sandals (2019), Papalia points out that the privileging of visuality in the art world has not only repressed unseen bodies of knowledge but also excluded the participation of non-visual cultures with their own histories. This ocularcentric tradition has created barriers for people with blindness and visual impairments to fully participate in the experience of visiting museums and galleries, thereby limiting the representation of diverse perspectives and experiences in the art world. Most of them are often unable to have a complete art experience, let alone consider pursuing art practices themselves.

According to the study by Argyropoulos and Kanari (2015) on the experiences of visually impaired museum visitors in Greece, most people with a visual disability stated that museums or galleries treat them as "occasional visitors" and do not adopt an inclusive approach based on the principles of "design for all."[1] Candlin (2003) claims museums and galleries position blind individuals as a unified group, and their needs and reasons for visiting these institutions are often ignored. Regardless of the individual differences among blind people, they can only visit in a disabled capacity, not as artists or art lovers, nor can they socialize or relax in the galleries. In addition, the visitors referred to a relatively high number of hindrances, including a feeling of unwelcomeness from museum staff due to the absence of proper training in working with visually impaired visitors. Regarding access to artworks, Argyropoulos and Kanari (2015) also argue that people with visual impairments are not always allowed to touch the objects,

[1] In 2004, European Institute for Design and Disability (EIDD)has defined design for all as "design for human diversity, social inclusion and equality" (Persson et al., 2014, p. 507).

resulting in the unfair implementation of the global restriction “Do not touch” for all kinds of exhibits. Such barriers can lead to various negative outcomes, including social exclusion, limited cultural participation and identity formation, reduced emotional well-being, hindered cognitive development, limited opportunities for creativity and self-expression. On the other hand, galleries face the challenge that visual artworks are often two-dimensional and one-of-a-kind, which has led to the long-standing exclusion of blind and visually impaired visitors from experiencing visual art. Thus, art institutions need to ensure accessibility for visually impaired visitors, but this affects their duty to preserve collections and artworks.

In general, art requires an emotional response from people, and we all have the capacity to instinctively respond whether sighted or not. For blind and visually impaired individuals, visiting museums or galleries is also a social or spiritual experience. Moreover, art not only provides people with aesthetic experiences but also serves many functions and carries significant meanings, such as fostering creativity, facilitating healing, and driving social change. Beete (2015) indicated that visitors are willing to delve deeper into the principles, theories, and motivations of the cultures that produce the works and the artists themselves. Many of these are entirely independent of visual perception. As Krantz (2013) emphasized: “we see through our brains, not our eyes. The eye is just one of our multiple senses sending information to the brain for cognitive processing” (para. 5). In fact, there are many ways to connect with art beyond the sense of sight.

Since the passage of the Americans with Disabilities Act (ADA) and other accessibility laws in 1990, art institutions and museums have been striving to make their collections more accessible to all people and have been actively developing inclusive and accessible services and venues (Haines, 2021). They recognize that accessibility is not just about physical space and that in order to be truly inclusive, they need to consider the broader needs of people with disabilities, including the accessibility of their content and interaction between visitors and art. As a result, many art galleries and artists have been exploring new ways to help visually impaired visitors experience and engage with art, such as providing tactile replicas of visual art pieces and audio guides that describe selected artworks.

However, Cho (2021) found that these solutions may not be enough to provide visually impaired visitors with a rich and independent gallery experience. As research into sensory substitution techniques and multisensory systems continues to grow, there is increasing interest among researchers and artists in exploring the potential of human senses in the art experience. In response, modern art institutions and museums are starting to rethink the limitations to the sensory use of objects and are exploring the potential of multisensory solutions to create new forms of artistic expression and provide visitors with rich emotional experiences that connect them with the sensory properties, background, and stories of artworks (Wang, 2020).

1.2 Research Objectives and Questions

This study aims to explore the challenges and opportunities involved in creating multi-sensory experiences for art institutions or visually impaired individuals, and to provide insights into the design and implementation of effective multi-sensory experiences that are inclusive and accessible to all. Additionally, the aim of this study is also to reconsider the role and representation of blind and visually impaired people in research and design. By centering on their perspectives and experiences, the researcher hopes that the public can recognize the importance of disabled people's creative work and its value to society. In order to accomplish the research objectives, the following questions should be examined:

1. How can multi-sensory experiences be created for visually impaired people or galleries?
2. How can we explore the multi-sensory dimensions of artworks with the visually impaired community to increase the possibility of involving this group as co-designers?

This study's exploration of multisensory art will help visually impaired visitors to be able to appreciate artworks on a deeper level, which will ultimately enhance their cultural enjoyment and increase their opportunities to engage with culture and art. Furthermore, this research will expand established knowledge of vulnerable populations. This knowledge will benefit art institutions and disability communities and may lead to a positive reconsideration of the significance of visual culture in our society.

In the following chapters, I first explain the cross-modal cognitive abilities of blind or visually impaired individuals to gain a deeper understanding of how sensory interaction and multisensory perception work. I then provide a review of relevant work on multisensory art experiences in museums and galleries. In the next chapter, I use semi-structured interviews with curators and visually impaired artists to explore how they create multisensory experiences in their work, as well as to outline challenges and future opportunities. In addition, I will discuss two case studies to explore the possibilities and benefits of involving the visually impaired community as co-designers in creating multisensory art. The study concludes with a discussion of how multisensory experiences can be created, their significance, and future opportunities for designing co-design and multisensory art for the broader community.

Chapter 2: Literature Review

2.1 Introduction

In the past, most artworks were primarily concerned with visual presentation, such as paintings and sculptures. This type of art is typically regarded as a unique visual experience that makes the audience play a passive role while excluding individuals with visual impairments. However, this visual-centric view has been challenged by the emergence of the "sensory turn" in the 1990s. This perspective emphasizes that sensory experience is not only related to physiology but also culture, society, and history. As a result, scholars from the humanities and social sciences have turned their

attention to the sensorium and challenged the long-standing monopoly of psychology on sensory and perceptual research (Wang, 2020). In recent years, contemporary neuroscience research on the human brain and its functions has significantly transformed our understanding of perception and cognition. This has led to an increasing focus on investigating the cross-modal cognitive abilities of individuals who are blind or visually impaired, enabling them to use other senses to comprehend and appreciate visual stimuli. In the wake of this "sensory turn," professionals within modern museums and art institutions are reconsidering the numerous constraints and inclusivity of access in their artworks and actively exploring multi-sensory experiences to meet each visitor's distinct abilities and preferences (Levent & Pascual-Leone, 2014). Furthermore, multi-sensory experiences have also inspired artists to explore the aesthetic possibilities of non-visual senses, prompting them to incorporate different senses into their work to evoke a new form of experience.

This literature review aims to delve into the existing research on the cross-modal cognitive abilities of individuals who are blind or visually impaired and gain insights into sensory interaction and multisensory perception. In the next sections, the study aims to review how galleries, curators, and artists utilize multisensory approaches to enhance opportunities for visually impaired visitors to engage with artworks.

2.2 The Cognitive Abilities of People Who are Blind or Visually Impaired

2.2.1 Current cognitive neuroscience research

In everyday life, individuals perceive and interact with objects in the world through multiple senses. For a long time, it was believed that the visual cortex of individuals who are deprived of sight would remain devoid of any specific functional role. However, Bauer et al. (2017) described for the first time the structural and functional differences of blind individuals' brains compared to sighted individuals. The authors observed significant changes in the occipital cortex, the area responsible for visual processing, in blind individuals, which enhanced connections between certain parts of the brain, thereby increasing the brain's ability for cross-modal processing. This cross-modal processing allowed the occipital cortex, which is typically visually oriented, to process other sensory inputs, such as touch, smell, or hearing. Bauer et al. also emphasized that in blind individuals, the occipital cortex does not process visual information but still participates functionally in many non-visual sensory processes.

Recent research has challenged the commonly held belief that the enhancement of other senses in individuals who have lost their vision is solely due to postnatal learning and experience (Bates, 2012). Instead, studies have shown that the brain adapts and compensates for the loss of sensory input through a process known as "cross-modal neural plasticity." Essentially, if we lose a sense, the area of the brain typically processes information related to that sense will not remain idle but will undergo a rewiring process and starts processing information from other senses. As our

comprehension of these interconnections continues to expand, individuals who are blind may experience an enhancement in their capacity to perceive and cognitively process non-visual sensory input. This can enable them to compensate more effectively for the absence of visual information, including but not limited to spatial awareness, object recognition, and language processing. Additionally, research on cross-modal neural plasticity and integration will help us better understand how the brain integrates different sensory information to create a more complete and enriched perception of the environment (Levent & Pascual-Leone, 2014). This theoretical knowledge has important implications for the development of multisensory experiences that meet the needs of visually impaired individuals.

2.2.2 Sensory interaction and multisensory perception

Most research on perception considers vision, hearing, smell, and touch to be entirely separate ‘perceptual modules’, as if each sensory modality operates independently to provide us with distinct insights about the outside world (Eimer, 2004). For example, only sight can perceive color, and only hearing can distinguish pitch. However, recent studies have shown that while the senses are functionally independent, they do not operate independently in most cases. Nudds (2014) argues that our perceptual experience at any given time is the result of all of our senses working simultaneously and that the same features of a particular thing can be perceived by more than one sense at the same time. This means that multisensory perception cannot simply be a

combination of single sensory operations but must involve some form of cross-modal integration. Additionally, Lloyd-Esenkaya et al. (2020) have revealed that the perception we derive from one sense can complement the information we get from another sense, leading to more reliable estimations of sensory sources. In other words, multisensory perception provides more accurate estimates than visual perception alone, maximizing our ability to perceive the environment. Perceptual experience is shaped by the complex interactions between multiple sensory modalities, as eloquently elaborated by Eimer. Senses have always been communicating and influencing each other, although we are often not aware of these cross-modal interactions and influences (Spence, 2020).

In recent years, some studies have utilized cross-modal associations to investigate how different senses interact with each other. Such associations are the relationships between stimuli from different modalities, such as olfactory and gustatory, auditory and visual, etc. Certain events usually stimulate multiple senses simultaneously, such as in the ventriloquism effect, where there is a mis-location in the perceptual experience of auditory objects or events due to seeing something at a different location. Regarding this phenomenon, Nudds (2014) explains that when there is a conflict between spatial and temporal features of different sensory modalities, the perceptual system combines or integrates them in a way that favors the most accurate and reliable source of information. In this case, the most reliable source of information is given more weight. Thus, in ventriloquism, considering that auditory information is poor in spatial terms, visual information is given more weight and usually provides useful information about

the location of the sound source, demonstrating how vision can strongly influence auditory localization (Driver & Spence, 2000). Mandrigin (2015) also mentioned that multisensory interactions are not limited to vision and audition, and there are a lot of evidence of interactions between five of the sensory systems.

Exploring sensory interactions and multisensory perception within the broader context of cognitive neuroscience may help us understand how different sensory information and modalities relate to each other through cognitive processes. If we can better understand how the different senses of blind individuals work, we may be able to develop more inclusive methods to support their access to art. Furthermore, research on multisensory perception and sensory interaction theories can greatly assist us in understanding how the brain integrates and processes information from multiple senses and how stimulation of one sensory modality can affect the perception of another. Understanding how different senses interact and combine is vital for enhancing the overall experience of blind and visually impaired individuals. On the other hand, understanding the cognitive abilities of blind individuals can help researchers and galleries better assist blind and visually impaired individuals in utilizing different senses to connect with their bodies and the surrounding world.

2.3 Existing Approaches to Creating Multisensory Experiences

As research turns its attention to sensory experiences, an increasing number of multisensory museum studies are based on neuroscientific evidence and have initiated

a dialogue between multisensory museum scholars and neuroscience researchers (Wang, 2020). This trend indicates a shift from the traditional emphasis on visual displays in museums or galleries toward a more holistic approach to exhibition design that engages multiple senses. In addition, many researchers now recognize the importance of interacting with sensory objects in cognition, socialization, and therapy, especially for people with disabilities. According to Levent & Pascual-Leone (2014), whether we realize it or not, museum experiences are multisensory. Harnpinijsak (2019) also points out that sensory design allows everyone to receive information, explore the world, and experience pleasure, wonder, and social connections, regardless of our sensory abilities. Furthermore, Vaz et al. (2020) agree that using multisensory approaches is crucial in providing blind and visually impaired individuals an opportunity to fully engage with art. This allows them to adequately understand the exhibits' information, appreciate their aesthetics, and emotionally connect with museum objects. Apart from that, some galleries and artists have begun to reconsider the various limitations on using senses within their works and are exploring the potential of multisensory solutions to make art more accessible and provide rich emotional experiences for everyone.

2.3.1 Multisensory Experience in Galleries and Museums

For a long time, most art galleries and museums have improved accessibility to artworks for the visually impaired primarily by providing instructional services, Braille

and audio descriptions and tactile graphics. However, in recent years, some museums have been using 3D printing technology to create copies to allow people with visual impairments to experience artworks. For example, the Prado Museum has launched the "Touching the Prado" exhibition, which featured six copies of 3D paintings, allowing visually impaired visitors to understand the works by touching them (Hewitt, 2015). Copies of 3D paintings improved more diverse texture representation than tactile graphic diagrams. However, they might still be challenging to understand without any verbal descriptions. Another consideration is whether most art museums can widely adopt the cost of constructing copies.

According to Ginley's (2013) observations, the Victoria and Albert (V&A) museum in London has been providing tactile sessions and touch tours for visually impaired visitors and offering a dedicated guiding service that can be pre-booked. Besides the tours, the V&A Museum also provides tactile books, audio descriptions, and numerous tactile objects throughout its premises that allows blind visitors to explore the museum through multi-sensory activities. Unfortunately, accessible tours and sessions are only available on specific dates and must be pre-booked, which can limit the number of visitors who can participate. Additionally, Cavazos Quero et al. (2021) argue that these methods do not support independent visits and exploration and can pose a risk of damage to artworks prepared for tactile exploration. Audio descriptions and accessible brochures also cannot fully convey the information contained in the artwork and require a certain level of knowledge in braille.

Besides these methods, a few art galleries and museums have found ways to make their experiences accessible through the adoption of multisensory translations and design practices. This approach has inspired a new research project known as the multisensory museum. According to Cho (2021), multiple senses can work together to enhance the experience for the visually impaired, allowing indirect perception of shapes through mediums such as sound, texture, temperature, and scent. Multisensory experiences not only help the visually impaired enjoy the gallery experience but also allow sighted people to view museum exhibits in a new way. The AGO gallery has been offering multisensory tours for people living with vision loss since 2016, in collaboration with OCADU and CNIB. Students from OCADU have designed 3D replicas or "translations" of paintings that enable visitors to experience the emotions and shapes in the images through multiple senses. They translate AGO Collection paintings into a physical experience that engages all senses, including smell, sound, touch, and even taste (Kopun, 2019).

In 2015, multimedia designer Ezgi Ucar collaborated with the Met Museum to create a "Multisensory Met" project, which offered a museum experience that engages all the senses. Through this initiative, Ucar (2015) explored innovative ways to enhance museum accessibility by experimenting with a variety of materials, such as adding sound and scent to small replicas of the museum's famous sculptures. She also worked on transforming reproductions of paintings into sound-sensitive artworks by connecting sound switches. They both experimented with different mediums and integrated diverse

art forms to create an inclusive gallery experience. However, these initiatives require professional artists to manually create tactile models, which is a very expensive and time-consuming process, resulting in only a small number of artworks being produced. Also, converting 2D pieces into 3D sensory experiences may erode or undermine the artist's original intentions.

2.3.2 Assistive technologies to enhance multisensory experiences

Over the past few decades, researchers have found that tactile graphics and audio guides are limited in conveying visual information of complex images and in helping blind and visually impaired individuals to independently experience and understand visual artworks. Therefore, some studies have begun to explore the improvement of accessibility of tactile graphics through various technologies that increase interactivity and independence. Volpe et al. (2014) explored four computer-based alternatives (tactile outline, textured tactile, flat-layered bas-relief, and bas-relief) to generate tactile 3D models semi-automatically from digital images of paintings.

Although this approach can help replicate two-dimensional artworks meaningfully, the result suggests that painting descriptions using audio guides or braille text forms must be used together with tactile models for blind individuals to understand them. Reichinger et al. (2016) developed a gesture-controlled interactive audio guide (IAG) with a depth camera for visual artworks, which can be directly manipulated by hand on the surface of bas-reliefs during tactile exploration and provide location-dependent

audio descriptions based on sensed user hand position and gestures. Additionally, Cavazos Quero et al. (2021), inspired by Reichinger et al.'s research, developed an interactive multi-modal guide (IMG) for blind and visually impaired individuals to enhance independent access and experience of visual artworks. The guide uses 3D printing technology to transform existing flat paintings into 2.5D replicas, in which users can access localized verbal descriptions and audio by performing touch gestures on the surface while listening to themed background music. The research results showed that the proposed multi-modal approach is simple and easy to use, and it improves confidence and independence when exploring visual artworks.

In addition to enhancing the autonomy and interactivity of blind and visually impaired visitors in accessing artworks, technology is also being used to provide them with better physical access to these environments, allowing them to experience them independently without the help of a guide. Anagnostakis et al. (2016) aimed to explore how to integrate both access needs by using touch-sensitive audio descriptions and touch gestures to replicate exhibits. Blind visitors can use a mobile application as a multi-touchpad to approach and explore replicas of exhibits through gesture movements. The application also provides navigation instructions that are related to the user's location, allowing them to navigate through touch exploration when arriving in front of selected exhibits. Another related study continuously tracks the user's position and orientation to achieve seamless interaction between navigation and art appreciation. Asakawa et al. (2019) created a smartphone app to guide blind and

visually impaired people to follow the intended path. They can listen to the audio content of artworks by simply turning their body towards them. The application has great potential to allow blind and visually impaired individuals to experience visual arts at their own pace and with the same experience as people with normal vision. However, users can only obtain information about artworks through audio descriptions.

The development of tactile and multi-sensory assistive technologies has expanded opportunities for blind and visually impaired individuals to interact with artworks on a deeper abstract level. However, these methods are unable to facilitate an experience of the colors of the artwork. Therefore, Cho et al. (2020) proposed the Tactile Color Pictogram (TCP) relief to enable visually impaired individuals to identify colors and interpret informational ideograms through touch. When used in combination with audio descriptions, TCP allows for immediate access to color information through color patterns. However, the tactile-only mode for encoding colors (TPC) may not provide a beneficial user experience for congenitally blind people, as tactile interaction is often slow and limited to fixed tactile color interpretations. Lee et al. (2021) attempted to convey color and depth encoding schemes to visually impaired individuals through alternative sensory modalities such as audition (by using 3D sound to encode color and depth information for audio descriptions) and touch (for interface-triggered color and depth information).

However, some research has explored multi-sensory interfaces for color recognition. Bartolome et al. (2021) designed a multi-sensory mapping that conveys colors to

visually impaired individuals using musical sounds and temperature cues. Cavazos Quero et al. (2021) proposed a multi-sensory color code system that uses sounds and scents to represent colors. Melodies express each color's hue and scents the saturated, light, and dark color dimensions for each hue. Overall, these methods explore conveying color in artworks to visually impaired individuals through the integration of patterns, temperature, smell, and music, which can help them appreciate artworks at a deeper level than just through hearing or touch alone.

2.4 Making Art More Accessible for the Visually Impaired

In the last couple of years, the awareness of making art more accessible has become more widespread. In addition to major museums and galleries joining the game, some artists, whether they are blind or have low vision or not, are trying to create art that is accessible to all. Roy Nachum is an artist who embedded Braille and extended descriptions into his works (Voyatzis, 2012). The Braille signage at a museum exhibition forced him to think of new ways to make his work more tactile and allow people to experience it by touching it. His work used Braille and "double vision" techniques that also challenge those with sight to question the limitations of vision. Nachum's innovative form of interactive art allows visually impaired and sighted people to experience the same art and share experiences and perspectives from a painting. Another artist, Andrew Myers, created tactile portraits from thousands and thousands of screws to break the rules forbidding touch and making them accessible to people with visual

impairments (Cantor Fine Art, n.d.).

One well-known blind painter, John Bramblitt, began using touch and color to create his paintings. He learned to distinguish between different colored paints by feeling their textures with his fingers, then using raised lines to help him find his way around the canvas to paint. His paintings shatter the prejudice that vision is the only channel into art and has encouraged many blind people who share his love of art to create works (D Emptyspace, 2019). Clarke is another blind visual artist who began playing with sounds, smells and fabric to create art. His abstract tactile works are inspired by the sound of the sea on a large fabric, which allows, regardless of visual ability, everyone to experience the art (Reynolds, 2020). In his 2022 exhibition "The Power of Touch," he combined Braille and dots so that both visually impaired and sighted individuals could read art through touch.

2.5 Conclusion

Previous research has focused on developing applications specifically for the visually impaired, while some studies have focused on categorizing them as audiences rather than cultural producers and creators. In contrast, the involvement of visually impaired individuals in the research and design process is often lacking. Additionally, multi-sensory and tactile tourism is only available on specific schedules and often requires advanced booking, making it difficult for visually impaired individuals to include gallery visits in their daily lives. Furthermore, most current practices rely on combining tactile

and auditory senses to describe or create paintings, and there is little exploration of how smell and taste can make artworks more accessible, nor are there sufficient user tests to compare different senses. Moreover, artworks prepared for tactile exploration do not include all collections due to the risk of damage. Multi-sensory experiences in museums or galleries may also affect the interpretation of artworks by translating them, which often requires a considerable amount of time, resources, and the involvement of artists.

Overall, this literature review explores the cognitive abilities of visually impaired individuals, focusing on cross-modal neuroplasticity, sensory substitution, and multi-sensory perception. Reviewed research indicates that the brains of visually impaired individuals undergo neuroplastic changes that enhance abilities in non-visual sensory modes. This neuroplasticity, combined with multi-sensory integration, can provide a more immersive and richer artwork experience. While there has been growing interest and focus on sensory research, exploring how different senses interact and combine in multi-sensory art fields can help better understand how to create effective multi-sensory experiences for visually impaired individuals. However, more research is needed to better understand the complex interactions between sensory modalities and how to effectively design multi-sensory experiences that involve the blind community as co-designers. Future research can explore new technologies and innovative strategies for creating multi-sensory experiences and developing methods to evaluate their effectiveness.

Chapter 3: Methodology

3.1 Introduction

This study aims to explore how multisensory experiences can be created for visually impaired people in galleries and how to involve them as co-designers in the process. Since this study involves an inclusive practice that encourages vulnerable participants or communities to express their ideas and experiences, it will employ a qualitative method grounded in an interpretive paradigm. According to Rashid et al. (2019), interpretivism allows researchers to have multiple perspectives on research problems by enabling them to see the world through the eyes of the participants. Moreover, interpretivism recognizes the importance of participants' subjectivity as part of this process, which aligns with the research questions that aim to explore the multisensory experiences and dimensions of artworks from the perspective of both the curator and visually impaired individuals.

Historically, disability research has been dominated by quantitative methods, resulting in a lack of attention to the social aspects of disability and the opinions of disabled individuals. Qualitative methods can help address this gap by providing a better understanding of the characteristics and needs of specific disability fields, complementing findings and extreme cases that cannot be explained in quantitative studies. The use of qualitative methods also allows listening to the voices of vulnerable populations to freely express their opinions and considerations and include them in research planning (Pretto, 2017). Additionally, O'Day and Killeen (2002) further argue

that qualitative research can keep researchers focused on the realities of the disability experience, leading to a more profound understanding of participants' perceptions and the development of action strategies to address their problems. From this perspective, Hartley and Muhit (2003) conclude that qualitative research plays a critical role in researching fragile social reality.

To address the research questions, the study conducted semi-structured interviews and case studies. Both methods offer a comprehensive understanding of the research questions. Semi-structured interviews were conducted with professionals in the field of accessibility, museum and gallery staff, as well as visually impaired artists. The purpose of these interviews was to gain insights into current practices and challenges in creating multisensory experiences. Another method used in the study was the case study approach, which provides practical examples and analysis of existing multisensory art practices in collaboration with visually impaired individuals.

According to Baškarada (2014), case studies allow researchers to conduct an in-depth exploration and analysis of complex social phenomena and gain a rich understanding of the problem. Yin suggested that case studies are a preferred strategy when the researcher has little control over an event and focuses on contemporary phenomena in certain real-life contexts (Rashid et al., 2019). In disability studies, Mazumdar & Geis (2001) analyzed the value of the case study method in disability research, indicating that it is a powerful and effective research method for studying people with disabilities. Case studies can provide an excellent sense of the unique

experiences of individuals with specific disabilities.

Therefore, in the case of co-creating multisensory art with visually impaired individuals, it involves various factors, such as the different needs and experiences of the participants, the specific challenges and opportunities involved in creating multisensory art, and the processes involved in collaboration and co-creation. By using case studies, the researcher can deeply explore and understand these complex and contextual factors, as well as gain insights from the perspectives of multiple stakeholders involved in the co-creation process, such as artists, educators, and visually impaired participants. This approach can provide a comprehensive understanding of the research questions and facilitate the development of effective strategies and practices for creating inclusive multisensory art experiences for visually impaired individuals.

3.2 Research Method

3.2.1 Sim-structured interviews

This study conducted structured interviews with two participants to explore their experiences and perspectives on multi-sensory art. One participant is a project curator for inclusive public programs and accessibility advocacy at the Art Gallery of Ontario. They focus on supporting underrepresented communities by collaborating on strategies, developing programs, and co-creating experiences that aim to reduce cognitive and physical barriers to galleries and their collections. The second participant is a blind

braille artist in the UK who hosted a series of exhibitions in the city. They create art for visually impaired individuals inspired by textiles, using soundscapes to stimulate tactile works that allow visually impaired individuals to "see" the sound and touch of visual art. Currently, the participant combines Braille with raised dots to create art pieces that can be read by touch, allowing visually impaired and sighted visitors to experience the art together.

Semi-structured interviews are highly used in research on disability. As Pretto (2017) points out, the interviewer can have a certain degree of flexibility and freedom to pose questions fully to explore the issues raised during the interviewing process. Therefore, the researcher developed interview guides based on the research questions, which included a series of open-ended questions (see **Table 1**) to allow for a thorough understanding of the participants' insights and experiences in the field of multisensory art. Thematic analysis was used to analyze the interview data.

All interviews were conducted separately at the Zoom meeting and lasted approximately an hour. The interviews were recorded with the participants' permission to facilitate the researchers' recording and analysis. Furthermore, the study received ethical approval from the OCAD University Research Ethics Board, given its involvement of human participants.

3.2.1.1 Results

Three main themes emerged from the data:

1. Multisensory experiences and practices

The blind artist reviews their artwork through audio descriptions as an emotional experience. Their work is primarily narrated to tell the story of their blindness, evoking an emotional connection with the audience and prompting them to learn more about the artist's journey. They stated that they created a color-coding system that assigns a unique color to each group of letters. Blind visitors can read his artwork through touch, while sighted people can learn Braille through color associations. They said this process is like "having a key and decoding it through sight." Additionally, they underlined this method allows blind and sighted people to share the same experience in an art museum and increases the visibility of Braille to everyone. The blind artist said they also considered these points when representing their artworks, using color theory to reflect the decoding of Braille in their work. They create letter pairing, with colors reflecting each other, just like complementary tones in landscape and portrait paintings.

Furthermore, they described that their artwork is mainly combined with auditory and tactile senses. By combining Braille with dots, everyone can experience their art. They stated that touch can provide a different and unique experience for sighted people: "Even if you have got sight, you will get a different experience touching something to be part of the art." In addition, the artist also emphasizes that in their work, a blind person can have more power in a visual environment than a sighted person.

Regarding the perspective on multi-sensory art, the artist mentioned that they have not yet participated in any such multi-sensory activities, but they expressed interest in the idea of tactile contact with art. However, the blind artist also mentioned that certain types of multi-sensory experiences, such as immersive installations, may overwhelm their senses and leave them disoriented. They emphasized that in their work, they strive to create multi-sensory experiences that are accessible and enjoyable for everyone, such as exhibitions that require touch, Braille, or sitting on the artwork to fully experience it. The artist also shared their personal experience of exploring new places with a white cane, and how they found that the vibration and texture of the floor can be an interesting way to navigate in multi-sensory spaces. In terms of technology, the artist expressed interest in exploring creative ways to present Braille and other methods in their work. Regarding multi-sensory experiences, the artist stated that as a blind person, their life is already a multi-sensory exhibition. They believe that blind people would become the best designers because they experience this kind of multi-sensory experience every day in their life.

The second participant shared that they and a professor designed a multi-sensory translation project aimed at creating opportunities for students to propose ideas that make art more accessible beyond the limitations of 2D art. This project involved collaboration among various stakeholders, including students, the curator, education and planning directors, media technicians, as well as blind and visually impaired communities. In this collaborative design, groups were formed around participants'

interests in the art to co-design different accessibility concepts and prototypes for specific art pieces. The curator emphasized that each group had a stakeholder from a non-governmental organization and a stakeholder from the blind and visually impaired community. These groups worked on copyright-licensed art pieces, each developing a prototype proposal. During meetings, students received feedback on their proposals and continued to improve their ideas. Students created a final project that included displaying their prototypes next to the translated art pieces and interacting with the public. They received feedback from blind and visually impaired communities and incorporated it into their prototypes.

The curator also mentioned that blind and visually impaired participants were usually interested in these prototypes and emphasized the importance of having a variety of viewing options, including for those who are congenitally blind or partially sighted, to include as many communities as possible. Regarding the technology in multi-sensory art, the curator pointed out that tactile technology allows individuals to experience and feel art through touch, although it is expensive and may still require audio descriptions to guide testing and authority in this area.

2. Challenges in creating multisensory art

The artist mentioned that color was the main barrier in their creative process. They used to remember colors, but now they are actively trying to create new color-tone memories, effectively retraining their brain to perceive colors in a different way. This process has

allowed them to see colors in a unique way that differs from how others perceive them. They said another barrier is the lack of opportunities for blind artists to collaborate with galleries. The blind artist claims that they are interested in working as a facilitator in art museums or galleries, but such opportunities are rare.

However, the curator mentioned that they faced budgetary and labor challenges as the project progressed:

> But as we started to move forward, we needed more and more budget for community consultants because they are providing so much labor…. when you have such an in-depth project like that. And it requires so much attention from all sorts of people. I find those things usually have a shelf life.

Additionally, the arrival of the pandemic resulted in students no longer making physical prototypes; instead they created videos.

When discussing the challenges and complexities of translating art into 3D replicas, the curator said, "Art is subjective, so the translation is never going to be perfect." They also compared the difference between art galleries and museums, pointing out that "if you go to the ROM, you can pull out several different objects of the same kind, and you're then touching the original. In an art gallery, you might have one Picasso, so you can do your best to describe it." Furthermore, the curator pointed out that artists often include unconscious elements in their work, making the translation more challenging.

Finally, they emphasized that it is very clear that when they participate in any of these projects, they are never meant to be reenactments. They aim to communicate and interact with participants because communication is necessary to create engagement.

In addition, the curator also pointed out the practical considerations involved in creating community engagement art projects, such as building relationships, compensating people for their time and expertise, calculating copyright fees, and involving living artists in the process. All of these require time, money, and effort. Regarding funding, the curator mentioned that the development department primarily raises funds for the overall operations of the museum and not directly for projects. This means they cannot simply apply for grants specifically for blind or visually impaired individuals. To address these issues, the curator stated that collaborating with universities can be mutually beneficial, explaining that students can gain valuable experience by participating in real-world projects, and curators and their organizations benefit from young people's fresh perspectives and opinions. The curator also emphasized the fact that exhibiting art is very different from the perspective of a museum versus an art gallery, especially with abstract works, which can be a challenge for art galleries.

3. Suggestions for including the blind in the creative process

The artist expressed a desire to see more diversity among artists who create multi-sensory experiences, including those with disabilities. They suggested that the creative

industry may need to change its perspective and include diverse individuals from the art world. In addition, the artist advocated for more open discussions about gallery accessibility, particularly regarding creating multi-sensory, non-visual accessible environments. The artist suggested holding a roundtable discussion with various stakeholders, even those working behind the scenes, to discuss accessibility. They believed such a discussion will be an art piece in itself, which can improve communication and participation on the topic.

The artist also suggests that galleries should encourage dialogue and conversation among visitors to create a space where people can share their experiences and emotions in real-time. They believe that art institutions should be seen as a space for engagement and cultural exchange rather than just a place to view art in silence. Additionally, the artist enjoys interacting with people interested in new art exhibitions, including lectures and tours, and found that visually impaired participants were happy to have the opportunity to interact with exhibiting artists as it added to their overall experience. Furthermore, the artist suggests that galleries and curators should think outside the box and consider how to make the exhibition experience engaging and enjoyable for everyone, rather than simply providing a tactile tour as a task to be accomplished. As a blind artist, they hope to be a facilitator, using their creative thinking to make art accessible to everyone. However, certain groups, such as diverse artists or LGBTQ artists, are often given priority, and they think blind artists should also have equal opportunities.

On the other hand, the curator emphasized the importance of building relationships with communities and compensating people for their time and expertise, especially those who share personal experiences related to discrimination or disability. This compensation should include payment, transportation, and food supply to ensure full participation.

However, regarding collaboration with blind artists, the curator suggested that decisions on planning such exhibitions must seek community opinions, and consideration should also be given to the artists' preferences when labelled as "blind artists" or "artists." In addition, to encourage participation from disabled artists, it is necessary to establish relationships with them, understand their perspectives, and be willing to collaborate to create a vision that respects their experiences for the exhibition. The curator emphasized that art institutions should examine traditional hierarchies and power structures, and recognize the importance of multiple perspectives in creating meaningful and inclusive exhibitions.

3.2.1.2 Summary

Based on the results, the two participants provided their insights on multi-sensory art and the inclusion of visually impaired individuals in the creative process from their roles and perspectives. They both emphasized the importance of touch in experiencing and appreciating art. However, the blind artist focused on creating multi-sensory experiences that everyone could participate in and enjoy, while the curator's practice

involved collaborating with different stakeholders to improve the accessibility of the gallery and its artwork.

Additionally, the blind artist highlighted their lack of opportunities to work with galleries. On the other hand, the curator also faced challenges in planning exhibitions featuring the works of blind and visually impaired artists, including time, budget, labor constraints, and the need to seek community input and consider artist preferences. Two participants both suggested that art institutions should include individuals from different backgrounds to understand their perspectives and work with them. It is worth mentioning both the blind artist and the curator emphasized the importance of the creative industry recognizing the value of multiple perspectives in creating meaningful and inclusive exhibitions.

3.2.4 Case study

Case study 1: Material Conversations: co-creation workshop

The Material Conversations project was created in collaboration between artist Caroline Wright, researcher Maryam Bandukda at University College London (UCL), the disability group "Beyond Sight Loss" (BSL) based in East London, and UCL scholar Tim Adlam. With the support of the UCL Trellis Community Engagement Fund, the team worked with BSL to explore the multisensory dimensions of materials and our reactions to them through different sensory experiences. Through this work, visitors are encouraged to touch, feel, and explore art, fully immersing themselves in the environment (Bandukda &

Wright, n.d.).

Based on Bandukda's research exploring the theoretical basis of multisensory experiences for blind and visually impaired individuals in open spaces, the team believes that multisensory art should not only represent the true synergies between different senses but also provide different ways to experience art. They held a co-creation workshop with blind and partially sighted people, where participants explored different sensory interactions with materials such as clay, rocks, lavender, playdough, and slime. During the workshop, participants shared their interactive responses to different materials and sounds, evoking memories and emotions and imagining new possibilities. In addition, participants provided feedback that using different materials in an environment helped them understand different spaces and navigate with the help of sounds.

During the co-creation process, the project team gained insights into how environments and different materials can enhance spatial understanding. This led to explorations of questions such as our relationship with materials, the meaning of touch mediated by the skin and one or more materials, and how visual understanding can mask material characteristics such as weight, surface texture, and elasticity. The team also delved into the connection between sound and touch, particularly relevant to blind and visually impaired individuals who use tools to navigate spaces.

Insights gained from blind and visually impaired participants and team members informed the creation of the exhibition artwork. Caroline developed a series of

multisensory artworks exhibited as Material Conversations that offer a range of experiences with materials through sound, rhythm, sight, and touch. For example, visitors can touch materials made into discs that can be placed on a turntable and "played" with different nibs while listening to the unique sound of each material captured by highly sensitive binaural microphones. Additionally, Caroline produced prints on paper using frottage, embossing, and monochrome printing techniques, which create tactile and visual images by pressing variably textured surfaces into and onto the paper (UCL, 2022).

The project explores understanding materials through touch and how touch and sound can help navigate and make sense of objects and environments. It provides a creative experience of exploring multisensory materials with blind participants, acknowledging the importance and validity of blind voices responding to museum collections and encouraging personal interpretation of exhibitions and artistic responses to them. While the project does not describe the co-creation workshop process and the feedback from blind and sighted participants in detail, it offers the possibility of creative sensory approaches in other applications and is a further exploration of creating multisensory artworks with blind and visually impaired people.

Case study 2: National Centre for Craft & Design (NCCD) co-creation sessions

Increasingly, museums and galleries are incorporating open facilities and prioritizing the improvement of accessibility by emphasizing on-site and exhibit explanations. According

to Chick (2018), multi-sensory exhibits tend to be minor additions rather than core features. It is crucial for curators to establish inclusive knowledge access for blind and partially sighted visitors by involving them in the curation and design of exhibits. This approach can lead to greater achievements. With this in mind, Chick describes her participatory design research conducted in collaboration with the UK's National Centre for Craft & Design (NCCD). The project aims to explore efficient ways of designing and planning non-permanent exhibitions through co-creation and co-evaluation that bring colorful knowledge access to visitors with sight loss.

Before co-creating the exhibition with participants, the author worked with NCCD staff to develop a working document that provided guidance and guidelines on how to design and plan non-permanent exhibitions, to provide intellectual access to visitors with sight loss. The working document covers topics such as exhibition design, interpretive panels and object labels, audio descriptions, tactile objects, touch and large font guides, lighting, object magnification, magnified images, and staff training. Additionally, the author first consulted with disability arts consultant Partington and built trust with participants on issues and technical considerations to be considered in planning and promoting co-creation workshops. Both sighted participants and other NCCD staff also received training from Partington on engaging with visually impaired visitors. The training was found to be crucial and necessary for building trust during the co-creation process of the exhibition.

Chick believes that participatory design is the most useful method for understanding the specific characteristics of NCCD's background, as well as the unique needs and perspectives of NCCD staff and blind and visually impaired visitors. Therefore, a Creative Lab group was formed with NCCD staff, two gallery assistants, exhibition designer Dechelle, five blind participants and their peers, and a disability arts consultant Partington. The first stage of the research project included co-creation workshops, including prototype-making meetings with the above participants.

Over a period of 5 months, they held three co-creation sessions, with no more than six participants at each workshop. The participants were all voluntary, but other expenses, such as transportation, refreshments, and lunch, were funded. The workshops were all held in the NCCD building to provide continuity. The primary question raised by the co-creation workshops was: how do we design and curate an outstanding non-permanent exhibition in a regional venue, prioritizing intellectual access for blind and visually impaired tourists? Since co-creation is usually based on tools and techniques that depend on visual communication, they adjusted all visual images to suit blind and visually impaired participants. During the first two workshops, participants wrote down ideas on a large whiteboard, which were then typed and projected onto a screen for all participants to see. The text was also sent to blind participants' laptops using audio text recognition software. As the relationships were established, participants could express their design and curatorial ideas more effectively, producing small-scale models of printed materials and design concepts.

The first meeting included training participants on the co-creation method, leading to novel improvements to the working instructions. In the second session, it was agreed that it was important to show the different materials and textures of 3D printing, which provided various materials for making tactile objects and an opportunity for participants to explore multi-sensory approaches. In the final co-creation session, the ideation, design, and curation stages were carried out, as well as a co-evaluation session. Low-fidelity prototypes were made to quickly obtain key feedback on design concepts from blind participants. Additionally, the second stage of the research will also evaluate the exhibition generated from this project.

The author aims to evaluate the effectiveness of providing intellectual access and gain a comprehensive understanding of each component of the exhibition through the triangulation of these data. To conduct the evaluation, two co-creation participants and two new blind visitors agreed to co-assess the completed exhibition through a brainstorming approach. Participants will first experience the exhibition on their own, then have a one-on-one tour (see **Figure 1**) with a gallery assistant, and finally, they will take a semi-structured interview with the author and NCCD staff to provide feedback on the exhibition about intellectual access.

Figure 1

Co-assessment session in the NCCD gallery

The result of this co-creation session is an exhibition (see **Figure 2**) called "3D Printing: The Good, The Bad, and The Beautiful," which explores how citizens, designers, and other professionals use 3D printing and explains how this technology brings about social, organizational, and economic shifts to the visitors. They made decisions about inclusive designs and practices, such as gallery colors and text selection, which were the clearest combination for visually impaired visitors, and the textured path that takes visitors to each multi-sensory desk in the exhibition space. In addition, Dechelle designed multi-sensory desks (see **Figure 3**), which are tables that include sensory objects, such as decorated phones (with audio descriptions of specific objects and readings of wall text panels), exhibit labels, and magnifiers. Visitors can connect the contents on the table to the background of the exhibit. The aim was to provide true access to every exhibition for all visitors.

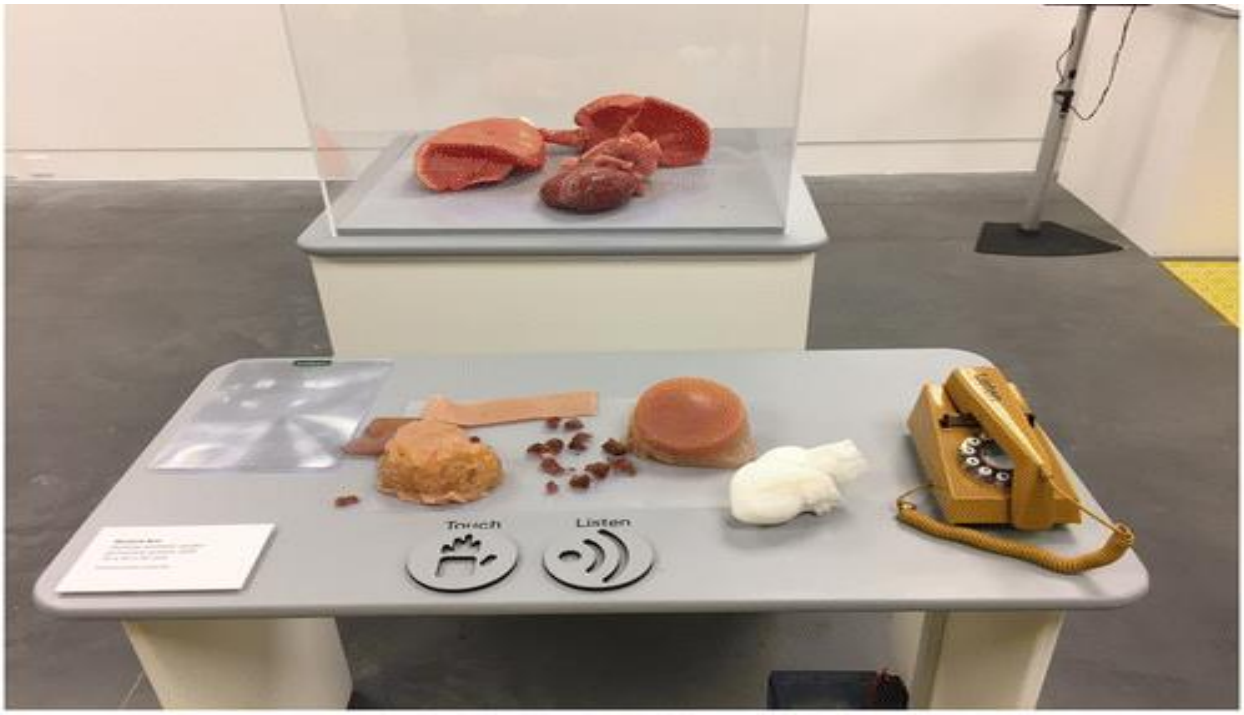
In addition, they made many accessible efforts in audio, lighting, and gallery assistant areas. For example, the audio description of the exhibits is played through old-fashioned trim phones, which means not only are visitors allowed to access the audio without using a smartphone, it avoids interference with the audio delivery. The author also emphasizes the importance of consistent lighting levels that illuminate objects and labels while avoiding shadows on the exhibits and walls. The exhibition uses new matte Perspex with no scratches to minimize light reflection on exhibit cases. Additionally, gallery assistants overcome communication barriers and confidently explain exhibition content to blind viewers through training and ongoing experience.

Figure 2

'3D Printing: The Good, The Bad, and The Beautiful' Exhibition

Figure 3

A multi-sensory desk



In the past 20 years, there has been an increasing interest in creating barrier-free environments for visually impaired individuals in museums and galleries. However, there is still little guidance and research on how to effectively promote collaborative processes between blind and visually impaired participants. Therefore, further analysis of this co-creation case study will expand our understanding of the complexity of designing and planning multi-sensory exhibitions in regional and local museums or galleries. The study comprehensively describes how to collaborate with different stakeholders and conduct preliminary work for co-creation sessions, research methods, iterative design processes, and challenges faced when working with blind and visually impaired communities. This will provide practical guidance and insights for future researchers,

designers, and curators seeking to create barrier-free environments in museums and galleries. Overall, this case study offers valuable insights and guidance for curators seeking to create barrier-free environments in museums and galleries. It highlights the importance of establishing relevant partnerships, involving visually impaired individuals in the design process, and addressing the unique challenges and opportunities of creating inclusive exhibitions.

Chapter 4: Discussion

My study aims to explore the challenges and opportunities in creating multi-sensory experiences for art institutions or visually impaired individuals and to provide insights for designing and implementing effective multi-sensory experiences. In addition, the purpose of this study is to reconsider the position and role of blind and visually impaired individuals in the creative process. By centering their perspectives and experiences, the aim is to enhance public recognition of the importance of the creative work of people with disabilities and their value to society. To achieve the research objectives, questions centered on how to create multi-sensory experiences for visually impaired individuals or galleries, and how to increase the possibilities of their participation as co-designers in this creative process. In this section, I focus on discussing the findings of the research results and then propose five design suggestions. Additionally, I elaborate on the significance and importance of this research to the wider community.

4.1 Including Blind Artists in the Creative Process for More Diverse and Innovative Art

Blind artists emphasized their desire to act as facilitators and collaborate more with art institutions to utilize their creative thinking to make art accessible to everyone. Such opportunities, though, are not always available. Increasingly, visually impaired artists demonstrate their ability to be positive agents of cultural change. However, previous research has focused more on collaborations between sighted artists and the blind and visually impaired community, gathering their experiences as a museum or gallery visitors to inform artistic creation. Therefore, museums or galleries should provide equal opportunities to visually impaired artists to create fair opportunities to showcase their creativity alongside other artists. For example, the two case studies explored in this study both involved collaborations with sighted designers.

Importantly, the blind artist participant expressed that, as someone who has experienced both sight and blindness, he is the perfect candidate for bridging the gap between art and blindness. Compared to sighted artists, visually impaired artists may have unique and innovative artistic approaches that can enrich the creative process. By involving them in the design and implementation of art projects, new ideas and techniques may emerge that sighted artists have not considered. Therefore, the creative industry should break out of the box and not just follow conventional methods but instead involve more diverse individuals from the art world.

4.2 Turning Braille into a Multisensory Art Medium

The blind artist participant believes that Braille is not just designed for the blind community but for everyone. He pointed out that Braille is not intended to be seen; people wrongly assume that the visually impaired read Braille through dots, but in fact, it is about patterns. In his multisensory art creations, he combines Braille and dots, allowing blind and visually impaired participants and sighted visitors to interact and appreciate artworks on the same level, thus enabling them to share the same experience in the gallery. In addition, he combines touch and hearing through Braille in his artwork, making it more accessible to everyone. Therefore, Braille, as an art form, promotes and encourages interaction between blind and sighted individuals. In addition to blind artists, more and more artists are using creative new methods with Braille in their artwork, such as Roy Nachum, who embedded Braille and extended descriptions into his artworks (Voyatzis, 2012), as discussed in the literature review. Therefore, Braille can be used as an accessible tool in art, allowing visually impaired individuals to participate in and appreciate art in new ways. Moreover, in future work, Braille has the potential to combine more senses, creating a unique and engaging experience for all audiences.

4.3 Building and Maintaining Constructive Relationships with the Community

The curator emphasized the importance of building relationships with the community, but there are many challenges in involving the visually impaired community in art

projects due to differences in experiences. Chick (2018) also mentioned that many effective co-creation tools are considered inappropriate because they rely on visual communication. To address this, decisions on curating exhibitions for the visually impaired community must seek community opinions and consider the preferences of artists when faced with the labels "blind artist" or "artist." Furthermore, institutions and researchers must recognize the importance of compensating individuals for their time and expertise, particularly those who share personal experiences related to discrimination or disability. This compensation should not only include payment but also transportation and food to ensure full participation. On the other hand, Chick also emphasized that researchers or institutions must cultivate practices that promote participants' knowledge and social contact. Therefore, before building relationships with the visually impaired community and co-creating exhibitions, sighted participants and other institutional staff or researchers should receive training on how to interact with the visually impaired community to build trust.

4.4 Exploring the Potential of 3D Replicas in Art Accessibility

In previous studies, the focus mostly explored the accessibility of museum collections, but there have been relatively few studies on the accessibility of visual art in galleries, and insufficient user testing compared to other sensory aspects of art. According to the curator, presenting artworks varies greatly depending on whether it is from the viewpoint of an art gallery or a museum. Moreover, it can be particularly challenging for art

galleries to make abstract works feasible. Therefore, the art and research fields should recognize the importance of studying the accessibility of two-dimensional art in galleries. Although some literature has begun to explore translating visual art into 3D replicas, some people believe that there may be problems with inaccurate translations. In response to this, curators explain that translating art is never about reproducing it. Their purpose is to communicate and interact with participants. She also emphasized that because we must communicate in order to create participatory relationships, we should approach 3D replicas from multiple perspectives. Transforming visual art into 3D replicas is a useful tool that can make art more accessible to visually impaired or otherwise disabled people and can generate versions that can be displayed and appreciated in different environments and settings.

4.5 Expanding Co-Creation Opportunities for Visually Impaired People

By involving the visually impaired community in the co-creation and updating process, museums and galleries can develop more suitable and inclusive experiences for all visitors. Increasingly, museums and artists collaborate with blind and visually impaired individuals to rethink how art is shared in their spaces. However, research is scarce on how museums and galleries can collaborate with the visually impaired community and multiple stakeholders to create more inclusive environments. Blind artists have also suggested advocating for more open discussions on gallery accessibility, particularly in allowing art to transcend the visual. Therefore, art institutions should recognize the

importance of co-creation conferences and group roundtable discussions, expand basic research on this topic, and develop guides or manuals for students, researchers, designers, and others involved in co-design. Additionally, from the perspective of galleries and curators, working with blind participants in co-creation events has always been a challenge. Co-creation sessions with visually impaired participants must be carefully planned. Materials should be provided in advance, rooms should be chosen with appropriate lighting and other facilities, and the organizers should acknowledge that the activity will require interdisciplinary methods and an adequate amount of time. Therefore, galleries should increase close collaboration with various communities and institutions, share resources, and continually iterate and update guidelines to promote inclusive and accessible co-creation activities.

Chapter 5: Conclusion

Museums and galleries have witnessed the increasingly important role that various senses play in visitor experiences. More and more research has found that multisensory experiences not only facilitate access to content, but also play a critical role in emotional engagement, memory, personal relevance, and reflection. Therefore, there is still a need for extensive research on multisensory art. This study aims to provide insights into designing and implementing effective multisensory experiences that are inclusive and accessible to everyone, by exploring the challenges and opportunities involved in creating multisensory experiences for art institutions or visually impaired individuals.

Based on a literature review, the study investigates the practices used by museums and galleries to create multisensory art and the assistive technologies used for multisensory experiences. It also discusses the multisensory methods employed by blind and sighted artists in their artworks. The focus of the study is to analyze the cognitive abilities of blind and visually impaired individuals, including cross-modal cognition, multisensory interactions, and multisensory perception, from the perspective of modern neuroscience, to create multisensory experiences for visually impaired individuals. It confirms that the brain will "reconnect" itself to enhance other senses in the absence of visual information. The interaction and integration of multiple senses can enhance the gallery experience of visually impaired individuals.

This study used qualitative methods and combined semi-structured interviews with curators and blind artists, as well as case studies on co-creating multi-sensory art with the visually impaired community. The study found that involving blind artists in the creative process and sensory research was rarely discussed in earlier discussions. Additionally, the study added to the understanding of multi-sensory art from the perspective of visually impaired artists and curators, which differs from previous literature. The study also analyzed case studies on co-creating multi-sensory art in-depth, which was rarely discussed in previous research. These findings enrich and deepen our understanding of multi-sensory experiences for the visually impaired community, provide insights for people to recognize the importance and value of

creative work by people with disabilities, and how to create multi-sensory art from various perspectives.

The study suggests conducting systematic interdisciplinary design research that integrates cognitive neuroscience, psychology, and sociology, into multi-sensory research, which helps researchers or designers deepen their understanding of multi-sensory experiences. In addition, this study reflects that the visually impaired community should be involved as co-designers, even trained as real designers. Blind artists can not only make artworks more multi-sensory and inclusive but also consider the unique needs and perspectives of visually impaired individuals. The study also recommends using Braille as a medium and exploring the potential of 3D replicas to bring innovative value to multi-sensory art. Moreover, building relationships with the community and expanding co-creation opportunities are crucial, and art institutions can create a more inclusive and diverse space for all visitors. However, at a deeper level of thinking, established knowledge about vulnerable groups should be reconsidered and expanded, as exploring multi-sensory art research can benefit not only blind and visually impaired visitors but also a broader community.

5.1 The Benefits of Creating Multi-Sensory Art in the Broader Community

This study expands upon established knowledge of a population of vulnerable individuals. Such knowledge will also benefit more broader communities: friends and

family of visually impaired people who may be able to enjoy a more shared experience of the gallery; the vision impaired community who could benefit from increased awareness of the need for inclusion and participation in all aspects of life; the wider disability community, many of whom may also be able to benefit from some of the accessible formats and increased awareness; other artists whose exposure to accessible art could broaden their thinking about art and how to convey ideas; sighted visitors who will be exposed to new ideas about access and inclusion, which will enhance their museum going through multi-sensory experience; and the elderly community will benefit by addressing visually impaired people's art accessibility, as most sighted people would also lose a certain degree of vision gradually as they age; museums and galleries will also benefit by boosting their reputation and increasing the number of visits a more diverse community. Altogether, these improvements will enrich visitor outlook and heighten impressions of the museum or gallery, making it a more inclusive and welcoming space for everyone.

5.2 Limitations and Future Work

It is worth noting that this study has some limitations. This is a qualitative study, so the results are not intended to be generalized to a wider visually impaired population. The researchers acknowledge that the study's sample size is small, and that more visually impaired individuals, artists, and curators need to be explored. The researchers

acknowledge the limitations of small sample size and homogeneity in age, but also note that these participants have extensive experience and vary greatly in physical abilities. Additionally, due to the scarcity of case studies on co-creating art with visually impaired individuals, the study's analysis may have limitations.

In future research, more samples from different stakeholders will be included to discuss the multi-sensory experience of blind and visually impaired visitors in galleries. Moreover, co-design workshops can be held with different stakeholders in future research on multi-sensory art. By involving the visually impaired community in the co-creation and iterative process, museums and galleries can further develop more convenient and inclusive experiences for all visitors. Furthermore, it is necessary to further study multi-sensory experiences in different contexts, such as education, health, and social activities, to explore the potential benefits of multi-sensory experiences for the broader community.

Appendix

Table 1

Outline of Interview Questions

Framework	Question
Multisensory experiences and practices	1. Could you tell me more about the multisensory translate project, and whether there was any feedback from blind or visually impaired participants? 2. Have you had the opportunity to collaborate with any blind artists? 3. I'm curious about what AGO is currently doing in terms of multi-sensory art. Are you still offering multi-sensory tours? And do you have any plans in the works for this area? 4. Could you walk me through your creative process and how you work to make your art accessible to people with sight loss? 5. I learned that your artworks primarily focus on the sense of touch. Have you also explored incorporating other senses, such as touch, smell and sound, into your creative process? 6. In your opinion, what are some effective ways to create multi-sensory experiences for galleries or art exhibitions? 7. What is your opinion on multisensory art? Or what is your opinion on museums and galleries promoting multisensory art right now? For example, touch tour or multisensory tour

Barriers and challenges	1. Do you think what challenges do galleries, or curators face when creating multi-sensory experiences for visually impaired visitors? For example, in terms of technology and equipment, physical design, cost or feasibility 2. How do you think we can increase the involvement of visually impaired individuals in the co-design of multi-sensory experiences in galleries and other artistic spaces? in other words, how can we involve visually impaired people in the creative process?
Suggestions	1. I am also interested in your thoughts on how can we involve visually impaired people or artists in the creative process? 2. What kind of resources or training do you think are necessary for galleries or cultural institutions to create multi-sensory experiences for visually impaired visitors? 3. What advice would you give to other artists or designers who are interested in creating accessible multi-sensory experiences for people with visual impairments?

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