

# “I tried everything. Nothing works.”: Challenges and Creative Processes from Digital Artists with Upper Limb Motor Impairments

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## Abstract

Digital artists with motor impairments in their upper limbs face considerable barriers to accessibility when using drawing tools. Our work aims to investigate the complex relationship between digital artists' creative processes and their accessibility challenges. We conducted 15 interviews with artists who use input devices to make digital art, analyzing their accessibility challenges for producing digital artwork. We reviewed how effective the solutions are in diminishing the impact on their creative processes and identifying design opportunities for the research community. Using thematic analysis, we look at the challenges participants reported in their artistic production, including managing pain, discomfort, and injuries alongside workarounds. Secondly, the artists reported the complexities of managing internal and external perceptions. Lastly, the ways creative processes are impacted by the accessibility challenges and solutions related to their upper limb motor impairments. We discuss research directions which can better address the impact of accessibility challenges on creative processes, the balance of creative agency over tools, and design insights for more accessible artistic technologies.

## CCS Concepts

• **Human-centered computing** → **Accessibility**; **Empirical studies in accessibility**; **Graphics input devices**; **Empirical studies in HCI**.

## Keywords

Digital Artists, Graphic Input Devices, People with Disabilities, Upper Limb Motor Impairment, Disability Art

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## 1 Introduction

Digital artists with motor impairments in their upper limbs face considerable barriers to accessibility when using drawing tools. This is particularly important because the number of people living with physical impairments will increase with the aging population shift [19]. Understanding creative production among people with disabilities matters because it serves as a social integrator, a self-expression medium, and, in many cases, an economic support.

Our study builds upon the work done by researchers who have explained the transformative journey art can bring to disabled people, forging connections to others [29]. Shifting the narrative from 'incapable' to 'capable' reflects a broader societal movement towards recognizing and valuing the talents and contributions of people with diverse abilities, challenging stereotypes and promoting inclusivity in the arts [33]. Furthermore, art projects positively impacted the well-being of individuals with disabilities, fostering a sense of community, creativity, and empowerment among participants [3].

Digital artists employ various input methods to craft and manipulate graphics, yet the exploration into the accessibility of these methods remains limited. While Human-Computer Interaction (HCI) researchers have developed features that improve keyboard typing and menu selection with pointers, there is a noticeable accessibility gap that persists in the creation of digital visual art.

Our study identifies the difficulties, pain, frustration, embarrassment, and discrimination when using tools to input and edit graphics. Analyzing reported expectations mismatch by digital artists with upper limb motor impairments, we explore opportunities for enhancing accessibility in digital art creation. Through analyzing their lived experiences, we aim to provide accessibility researchers with material limitations to help design more inclusive solutions.

Our research questions are:

- “What are the challenges digital artists with upper limb motor impairments face when using graphic input devices, and what solutions do they adopt?”
- “How well do these solutions mitigate the impact on their creative processes, and what design opportunities can be explored further?”

The motivation of our work is to investigate the complex relationship between digital artists' solutions with motor impairments and their usability challenges, offering insights for future design endeavours on which HCI researchers should focus. Our main contribution is examining participants' creative processes and their difficulties in artistic production. Our research involved conducting 15 semi-structured interviews to gain empirical insights into

the challenges faced by digital artists with upper limb motor impairments and the adaptations they employ. As part of our data collection, we conducted behavioural observations to obtain first-hand insights. We used thematic analysis to code these in-depth interviews, understanding digital artists' real-life experiences regarding the accessibility challenges they encounter in relation to their creative processes. We share our findings regarding their strategies for maintaining flow while coping with pain, discomfort, and injuries. Additionally, we analyze the intricacies of navigating internal and external perceptions as an artist with an impairment. Finally, we explore how accessibility challenges stemming from upper limb motor impairments influence artists' creative processes and the solutions they adopt.

## 2 Related Work

### 2.1 Creative Processes of Visual Artists

Visual artists create their artwork through a process that the environment can influence. Botella et al. investigated the creative person and process, affecting the phases of creative ideation, documentation/reflection, initial sketches, form testing, and final art object creation [4]. They identified factors that can facilitate or inhibit these creative processes, including personal characteristics such as gender, artistic domain, and experience. For example, artists must manage unfavourable emotional factors to maintain their creative processes. The 4 P's framework of People, Process, Press, and Product supports these ideas, showing how artists recognize and reflect on their creative processes as influenced by internal factors such as inspiration, experimentation, and sustained effort, along with the significant role of external influences such as peer work and audience feedback [10].

Artists often describe flow as a state of deep concentration and calm, which they identify as essential to their creative endeavours. Chemi ran a study with 22 high-achieving professional artists to investigate artistic creativity, explicitly focusing on how they create, learn, and organize their work [7]. The concept of "flow" emerged as a central theme from Chemi's research, perceived as a prerequisite and an effect of creative processes. This conclusion makes

it essential to study what aspects influence triggering, facilitating, and guiding the creative flow.

According to Banfield, mastery emerges from the experience of flow, which aligns with the idea that challenging oneself within the creative process leads to focused engagement [1]. This concept suggests that stretching one's abilities, uncertainty, and fear of failure drives efforts toward mastery and achieving new creative heights. Banfield's research helps us understand the complexity artists need to navigate between flow, challenge, and mastery to produce creative work.

### 2.2 Visual Arts and Disabilities

Visual arts can be critical in identity formation among people with disabilities. Suleski et al. reported the mechanisms that arts offer avenues for self-expression and cultural engagement, fostering positive disability identities [30]. Several studies have explored the relationship between visual arts and disabilities. For example, Reynolds and Prior investigated the flow in art making as a therapeutic way for individuals with cancer to manage intrusive thoughts and regain a sense of control [28]. Morris et al. emphasized that artistic processes can yield psychosocial benefits not typically addressed by conventional rehabilitation methods [22]. They concluded that through art, individuals with disabilities can develop confidence, self-efficacy, and goal-setting abilities that empower them to navigate recovery with increased control and hope.

Addressing accessibility in digital art tools is essential for enabling artists with disabilities to participate fully in creative endeavours. Dobransky and Hargittai emphasized the importance of enhancing accessibility features in digital art platforms, such as supporting alternative input devices and customization options, to cater to the diverse needs of artists with motor impairments [12]. Perera et al. [26] tell us that for people with upper limb disabilities, visual art is an important activity that allows for expressing individuality and independence. In this context, the intersection of digital art creation and accessibility for individuals with motor impairments is increasingly vital in HCI and Assistive Technology (AT) [11].

### 2.3 Input Methods for Digital Artists With Mobile Impairments

Digital artists might use an input device such as a mouse, trackball, or a digitizer tablet with software to create and edit graphics. Instead of defining separate aspects of hardware and software, Jacob et al. describe the concept of integrality, expanding the theory of graphical interactive tasks and the control structure of input devices [17]. Artists with physical impairments can experience significant barriers when using these integral inputs to produce creative work. Harada et al. explored utilizing voice as an alternative input method for drawing [13]. Diment and Dibbs explored the benefits of using body gestures captured by a camera as a visual art creation method [11]. The kind of tools being explored brought a new discussion among scholars about art agency and ownership when using Artificial Intelligence (AI) tools for visual art co-creation [18, 32].

HCI researchers have studied how pointer-based systems can be evaluated and improved in terms of accessibility [20, 21, 27]. Prior work by Harris on advanced technology for people with disabilities



**Figure 1: Digital portraits by P6. Her works cover disability advocacy and representation matters.**

Figure 1 shows two digitally created visual artworks, the one at the left has a lady smoking a cigarette and a visibly notorious knee accessory; the one on the right shows a lady sitting down with a tiger figure on her clothes and she is using a machine to assist her breathing.



**Figure 2: Artwork samples from P7, a professional artist who survived a stroke and now uses his accessibility features intensively to continue producing digital works.**

Figure 2 shows two digitally created visual artworks, the one on the left is a photo-realistic taxi car waiting at a traffic light; the one on the right is a detail of a pixelated city with many small details, all in black and white.

found that one of the main obstacles was the prohibitive cost of both mainstream and “specialized” devices [14]. Hurst and Tobias explored DIY experiences from people who rely on AT, finding that online communities play a critical role as a space to share ideas about AT, which solutions worked, and how to implement them [16].

Specifically, Creed et al. [9] investigated that new digital tools could offer alternative opportunities to support artistic practice, which could benefit people with motor impairments. Effective input methods are essential for artists with motor impairments to create and manipulate digital artwork, as Neate et al. pointed out in their study from 2020 [23]. Barbareschi and Inakge point out that art has deep connections to disability studies and HCI research [2], linking the interviews they did with 17 wheelchair users to find out the potential of collaborating with disabled artists in research. This connection is essential to our study because it shows that understanding the complexities of AT usage allows us to rethink the design of new artistic technologies.

Creed reported in a subsequent study the limitations visual artists experienced concerning their disabilities [8]. He found that visual artists worked with limited art forms that were feasible or accessible. While some artists experienced frustration when they could only work with the assistance of a caretaker, complete independence is not necessarily a specific goal. This is an important finding for our research because it uncoupled independence from artistic production. Nevertheless, Creed did not inquire about the creative processes we are addressing in our current work.

While much of the research has focused on improving accessibility of the input devices and applications such as eye gaze drawing, in mainstream computing tasks such as typing and navigation, there is a growing recognition of the unique challenges digital artists face with motor impairments [15, 23]. Harris in 2010 [14] has pointed out how disabled people do not commonly use mainstream technologies and software, to which Creed’s findings in 2018 [8] offer a contradiction since he reports only a minority use specialized accessible methods to use their computers. Creed hypothesizes this is a trend, given that mainstream products include accessibility features and a wider choice of devices, such as mobile platforms. We want to update and re-evaluate these findings in our research.

### 3 Methodology

We conducted 15 semi-structured interviews to empirically understand the challenges and solutions of digital artists with upper limb motor impairments. We conducted the interview sessions remotely via Zoom video conferencing to accommodate participants’ diverse geographic locations and mobility constraints. Each interview commenced with a brief demographic survey to gather basic information about the participants, followed by an introduction to the research scope and objectives, along with the provision of a consent form outlining the voluntary nature of participation and confidentiality measures.

The interviews lasted approximately 60 minutes on average, and we compensated participants for their time with an e-gift card. We recorded the audio and video to transcribe them later, adding our observed notes during the hands-on exercise. Before collecting data, we obtained ethical clearance from our institution’s Ethics Review Board for this research study.

We included the full questionnaire in the Appendix A. We grouped our questions into the following categories:

- **Drawing:** Seven questions focusing on how users experience sketching, drawing shapes, and colouring.
- **Editing:** Six questions about the experience of manipulating existing graphics by deleting, moving, recoloring, and reshaping.
- **Input Devices:** Two questions focused on the challenges of using input devices to manipulate graphics. Participants were asked to show how they used their pointer devices for the Drawing and Edition tasks above.
- **Solutions:** Five questions asking participants about their experiences finding workarounds and hacks that made using their current input methods more usable.
- **Future Assistive Technologies:** Four questions focused on understanding user needs and imagining future ATs for graphic input devices.

First, we asked participants to describe their artwork, techniques, motivations, and habits when drawing and editing graphics with their computers. The participants showed artwork samples and described the process they would typically go through creating them. We asked them to explain the tools they use for different parts of their drawings, such as selecting layers, using pre-made shapes, and colour selection. We also asked them to describe how they edit graphics in their art practice, using features such as selecting multiple objects, resizing, aligning, and re-colouring shapes.

In the second part, we asked participants how their impairments affected their creative processes. We asked them for details about their computer inputs, how they use accessibility features, the solutions they currently use, and their existing challenges. Furthermore, we invited them to demonstrate their drawing techniques and software utilization, describing their different tools. We also asked for demographic information and relevant details about their computer use and motor impairment in this part. We asked the participants to think aloud while carefully observing the process, taking notes of the tools they chose and asking for clarifications when they made errors. Participants shared their screens and the camera, when possible, to understand their process fully. P1, P8, and P15 had technical limitations, which we addressed with further verbal descriptions and clarifications during the interviews.



Finally, we wanted to understand the design opportunities in the software and the computer inputs digital artists use. We decided it would be a good starting point for the participants to describe solutions they have tried and did not work for them, narrating examples of how they engaged with the tool in a way that was not suitable for their creative needs. From that conversation, we asked participants to imagine possible solutions to address their needs better, explaining why they thought it could be helpful for them, and describing detailed examples of how these imaginative devices or features could be used.

### 3.1 Recruitment

We recruited participants who self-identify as digital artists with upper limb motor impairments, setting the eligibility criteria to use graphic input devices to draw or edit graphics during their regular tasks, for producing amateur or professional artwork for at least three hours per week. With our eligibility criteria, we excluded people with motor impairments who draw only on analog methods (brushes, pens, others), and people who use graphic inputs for their computers but do not live with motor impairments.

The eligibility criteria screening questions included three simple questions asking for samples of their artwork, the software and hardware tools they used to produce art, and a brief description of their motor impairment. We established these selection criteria according to the research interest in gathering information from experienced users who regularly encounter difficulties and can report unsolved challenges with their input devices while avoiding novice user experiences that could relate to learnability issues.

We recruited participants through a multi-faceted approach, incorporating posters, email correspondence, and social media platforms to reach potential participants who met the inclusion criteria. Most of the respondents to our call from social media did not meet the eligibility criteria of drawing and editing graphics regularly over three hours per week, or they did not have motor impairments in their upper limbs. We contacted twelve of the fifteen recruited participants by directed emails to art institutions, personal acquaintances of the researchers, disability advocates, and art on art-oriented networks such as Instagram.

### 3.2 Participants

We report participant demographics in Table 1. Nine participants identified as male, five as female, and one as gender fluid. Eleven had finished a bachelor's degree, P12 was about to finish her undergraduate studies, and three (P2, P3, and P6) had high school as their highest education level. We recruited nine participants who were in North America, while the remaining six were in China; a reflection of the recruitment by directed emails, and the background of the researchers. With the exception of P5 (age 46) and P7 (age 55), all other participants' ages ranged from 22 to 33; the overall average age of the participants ranged between 31 years, with a standard deviation of 9 years.

As stated in Table 1, participants self-reported a wide range of motor impairments. Four digital artists had challenges with their fine motor skills due to cerebral palsy, three participants had limited movement in their upper limbs due to a spinal cord injury, two with sequels of a cerebrovascular accident (stroke), and a wide range of other different impairments.



**Figure 3: Graphic design posters prepared by P13 combining existing graphics from an online template.**

Figure 3 shows two digitally created visual artworks. The one on the left is red coloured with a young man holding roses and some Chinese characters, the one on the right has a blue background and a photograph of a young person's face is in the center, with the eyelids closed and a purple coloured butterfly is on his or her mouth.



**Figure 4: Commercial artwork samples prepared by P11 with templates and custom graphics made with a digitizer tablet, used for social media advertisements and promotion.**

Figure 4 shows two posters. The one on the left is light blue and green in colour, and it has some hand-drawn Chinese characters. The one on the right is dark pink in colour, and it has some tones of blue and yellow, with some white Chinese characters.

In Table 2, we include the information about participants' digital creation habits. Only two participants (P4 and P7) used Mac computers, while the rest used PCs as their primary working station. P1 and P13 used an iPad beside their PC to create art. Reinforcing the findings of existing related work[8], most participants used commercially available input devices, with only five (P4, P6, P8, P10, and P11) using a graphic input device. Only P15 used a custom AT device to operate her computer, as seen in figure 9. We included artwork samples from the participants in the Figures 1, 2, 3, and 4.



**Table 1: Participant Demographic Information**

P#	Gender	Age	Country	Education	Impairment	Mobility Conditions
1	Male	29	Canada	Undergraduate	Spinal cord injury	Imprecise fine motor skills
2	Male	28	Canada	Secondary	Muscle weakness	Cannot exert force with fingers to click and drag
3	Male	26	Canada	Secondary	Fine motor skills	Intermittent tremors when clicking
4	Fem.	24	Canada	Undergraduate	Chronic pain	Limited movement in range and in duration both on wrist and fingers
5	Male	46	Canada	Undergraduate	Cerebral palsy	Cannot extend fingers and limited fine motor skills
6	Fem.	33	USA	Secondary	Ehlers-Danlos	Joints are easily injured
7	Male	55	USA	Undergraduate	Stroke survivor	No control of dominant hand, limited movement on the non-dominant hand, and tunnel vision
8	Fem.	25	Canada	Undergraduate	Stroke survivor	Reduced movement of dominant hand
9	Male	36	China	Undergraduate	Cerebral palsy	Fine motor control on one finger reduced mobility on the rest of the hands
10	Male	31	USA	Undergraduate	Multiple sclerosis	Reduced mobility and pain on both limbs
11	Fluid	24	China	Undergraduate	Cerebral palsy	Reduced fine motor skills, limited range of movement on arms, and uncontrolled body movements
12	Fem.	22	China	Undergraduate	Cerebral palsy	Reduced fine motor skills
13	Male	30	China	Undergraduate	Spinal cord injury	Cannot extend fingers, and reduced strength on hands and arms
14	Male	32	China	Undergraduate	Spinal cord injury	Reduced mobility, with better control over one finger on each hand
15	Fem.	26	China	Undergraduate	Arthrogryposis	Limited upper limb movement

### 3.3 Data Analysis

We used thematic analysis (TA) to analyze the qualitative data from the semi-structured interviews [5]. Our study focuses on understanding digital artists' real-life experiences and creative processes, especially when facing accessibility challenges. As part of our data collection, we asked participants to show us their artwork and their input methods during the interview to gain insights of their creative processes. We adopted TA as an analytical approach conducive to such studies, emphasizing the researcher's interpretations over methods like code reliability or grounded theory [6].

After automatically transcribing the recorded interviews, and manually amending mistakes, we entered all the data interview data into the MaxQDA software [31]. Initially, the primary author conducted an inductive analysis, coding the interviews to generate a preliminary set of codes.

We then organized these codes into subthemes and themes by identifying recurring patterns and central concepts [5]. The second and third authors reviewed the codes, introducing new ones as needed. We resolved disagreements through discussion, leading to the refinement or addition of codes. In our collaborative and reflexive approach to TA, we strived to interpret the dataset, the theoretical assumptions of the analysis, and the analytical skills/resources. This way, the themes are a consensus of meaning, which organizes the findings in central concepts [6]. This iterative process continued, refining the codebook, re-coding the interviews, and

grouping the codes within themes. We include the final codebook as an Appendix B.

## 4 Results

In this section, we describe the thematic analysis's emergent themes to address the two research questions of our study. We look at the accessibility challenges digital artists with upper limb motor impairments face when using graphic input devices and the solutions they adopt. And we analyze how it affects their creative processes, identifying design opportunities that can be explored further. After refining our coding system, we created 42 individual codes to code with 214 segments of our notes. We grouped codes into eight subthemes and then into three main themes.

### 4.1 Theme #1: Challenges in artistic production

Participants engaged in artistic creation using computers, finding challenges directly related to their software and input devices. Existing literature analyzed these issues with quantitative data, accessibility challenges [8, 14]. In this theme, we aim to report the findings of the in-depth analysis of people with motor impairments in their upper limbs experience when digitally producing artwork.

**4.1.1 Managing pain, discomfort, or injuries:** When producing artwork, our participants reported experiencing challenges that hinder artistic production, including interruptions due to pain, discomfort, and injuries. For example, all participants mentioned finding methods and ways to work with their "specialized" input

**Table 2: Participant Computer Usage Information**

P#	Device inputs	Software tools	Hours per week	Primary Device	Drawing Strategies
1	Mouse	Online editor w/templates	12 - 15	PC	Accessibility features for fine movement
2	Mouse	Photoshop, Fusion 360	20 - 35	PC	External mouse avoiding click and drag
3	Mouse	Corel Draw, Photoshop	12 - 15	PC	Combination external mouse and using touch screen to free draw
4	Digital Pad	Illustrator	10 - 12	Mac	Stylus, holding it lightly to avoid pain
5	Trackball	Illustrator	10 - 12	PC	Key combinations and click-selects from templates
6	Digital Pad	Krita	12 - 15	PC	Bigger sized stylus for comfortable grip with custom sensitivity settings
7	Mouse	Mac Paint, Photoshop	20 - 35	Mac	External mouse with non-dominant hand in combination with zooming in settings from accessibility features
8	Digital Pad	Illustrator, View Plus Procreate	12 - 15	PC	External mouse with non-dominant hand
9	Mouse	Photoshop, WPS	12 - 15	PC	External mouse on top of laptop keyboard to press key combinations
10	Digital Pad	Paintstorm Studio	3 - 5	PC	External mouse and cellphone
11	Digital Pad	Krita, Photoshop Illustrator	20 - 35	PC	Combination of stylus with external macro pad, and uses Sticky Keys accessibility feature
12	Mouse	Photoshop Illustrator, TinkerCad	12 - 15	PC	External mouse and cursor movement by pressing keyboard arrows for precise control
13	Touchscreen	Online editor, Procreate	20 - 35	PC and iPad	Touch screen (using knuckles) with accessibility features, combining pre-made templates with custom graphics
14	Touchpad	Online editor w/templates	3 - 5	PC	Tuchpad with accessibility settings to select from pre-made templates
15	Touchpad	Photoshop	10 - 12	PC	Mostly mouth operate custom AT device and occasionally presses keys for functions

devices to use the computer for their digital art. P4 described how using a stylus as an input method was painful, which made her limit their drawing sessions to a maximum of 20 minutes. She also told us that *“short brush strokes tend to hurt a little more [...] And it feels awkward because I know I will need to use Ctrl+Z many times [to fix the mistakes it will cause using small lines].”*

P6 shared how she chose older technology because the shape was less uncomfortable, given that more modern stylus models were thinner and more difficult to manipulate. P6 told us that the older model of the stylus which she uses is discontinued now, but it is still available through online resellers; she lamented paying a higher price than the newer ones. Even using a suitable tool, her workflow included taking great care to avoid injuries: *“You do what you can to adapt. I did learn early on that I needed to take care of my hands, wrists, and such. Because of my condition, I am prone to injuries in my hands and wrists. And so I need to take lots of breaks.”* P6 emphasized the importance of taking proper breaks during work to avoid potential injuries that could prevent her from working on commissioned artwork, essential for her economic stability.

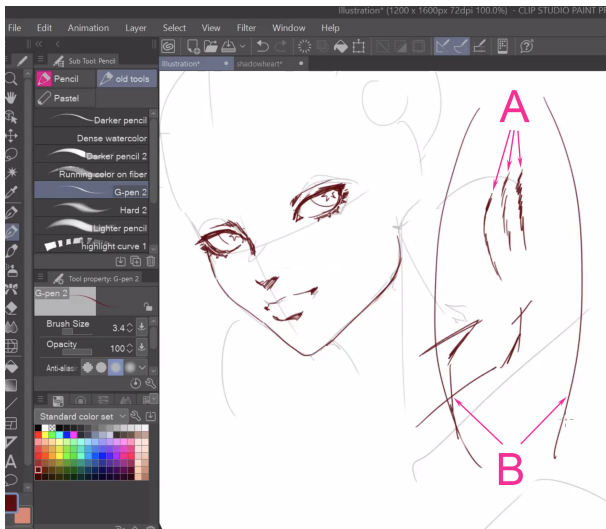
**4.1.2 Workarounds for artistic production:** The workarounds artists with mobile impairments use to be able to produce artwork had an impact on the way they create because of the extra time and

complexities introduced. Eleven of the participants explicitly acknowledged how their impairment limited their creative processes. P7, a recognized visual artist who is a stroke survivor, showed us how his technique now includes clicking with an external mouse pixel by pixel, avoiding using any other software tool. *“If you want to make a circle, you know, you make a circle pixel by pixel, right? [...] So, yeah, it’s like that. The style is like that.”* P7 shared with us that completing one visual artwork takes them an average of 900 hours.

The conversation with P9 revealed that due to his hemiplegia, he places the external mouse on top of the laptop keyboard to press keys while moving the mouse pointer. He demonstrated his solution by pressing key combinations and moving the pointer using Adobe Illustrator, stating *“This is how I do it. Simple, isn’t it?”*

**4.1.3 Unhelpful, unknown, and unavailable solutions:** Artists faced significant difficulties in finding better solutions, despite their efforts. These challenges people with disabilities encounter when looking for AT solutions were reported by Hurst and Tobias, with cost being a crucial aspect of selecting tools [16].

Seven participants said they had tried several solutions only to find few that could be helpful. One of the aspects that participants recurrently mentioned was the cost of the ATs they could choose



**Figure 5: P4 drew long soft lines (A) compared to short strokes (B), which caused more tension on her wrist.**

Figure 5 shows a drawing software, with a sketch of a woman and two groups of lines labeled as A and B.

from. P13 expressed clearly when he mentioned *“I only know about these functions because I’ve searched online, but I don’t have access to them for personal use, and the prices of most of these products are relatively high. I’m more familiar with them, but they’re often priced too high, and many are just aware of them but can’t buy them.”*

An artist like P6, whose body of work is about disability advocacy, articulated the struggle clearly: *“My main complaint would be the financial aspect of all of this. It’s really hard being disabled and wanting to be an artist because all this stuff is expensive. All this digital stuff is really expensive. The programs are getting more and more expensive, like Photoshop and Clip Studio, and are even subscription-based.”*

When discussing with P3 the practical challenges he faces when working with only one hand as a graphic designer, he shared his concern about the delays introduced by having to click through complicated menus when trying to access options which are available through key shortcuts he cannot press: *“I can’t do it with my right hand, so I have to use my left [hand]. It affects you because you can’t press undo [with the key combination CTRL+Z], and that doubles the work. So you cannot work if you cannot use mouse and keyboard very well.”*

During our in-depth interviews, five participants mentioned knowing what they needed, noting that the technology involved was not complicated. Nevertheless, no commercial product was available which could fit their needs. For example, P15 described how she has been longing for a solution that could serve better than only using her mouth to draw: *“Whenever I pass by an arcade, I think about this. It’s what I imagine: using a mat as a mouse and keyboard for my computer.”*

Along the same lines, P10 described a solution for his difficulties holding the button down of his mouse while dragging, which is an obstacle to resizing or moving images. Given the pain caused by



**Figure 6: The screen of P7 when he paints his art pieces pixel by pixel using his mouse.**

Figure 6 shows an old computer with a white/black screen full of pixels.

holding down the button while moving his hand, he envisioned a mouse with one extra button that toggles the dragging function. Nevertheless, he also told us: *“I think this wouldn’t be difficult to achieve, but I haven’t encountered such a design yet.”*

When asked about which accessibility features they have tried or wanted to try, seven participants expressed they did not know their computer had functions to assist them. In this regard, P7 said: *“[Accessibility features were] supposed to be easy, right? And also easy to find.”*

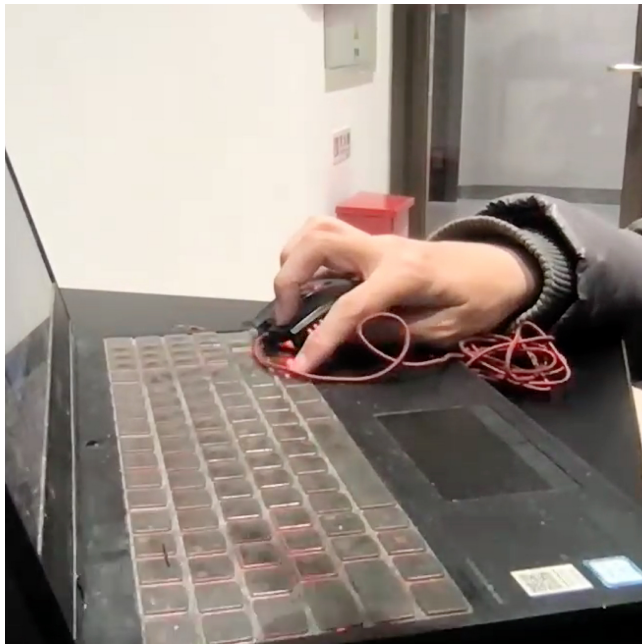
## 4.2 Theme #2: Managing perceptions

Being an artist and being disabled implies managing perceptions within the creative creation, which exist within the daily lives and the context of society. In this theme, we analyze the internal and external perceptions under which digital artists with motor impairments carry on their creative processes, and how the challenges impact how they see themselves and understand being seen by others.

Participants showed they perceive the artwork produced as less valuable if their disabilities limited their artistic processes, often denoting how the look of others influences them. Our literature review shows that internal processes require agency over their creation [10]. Many participants reported, in their own words, how their internal perceptions of themselves and their identity as an artist and as a person living with a motor impairment are fundamental.

Artists need to balance their practice between their artistic intent and what a potential audience might value [10]. The value of their creative output is significant to people with visible physical impairments, denoting they are artists first and that the audience should consider their work independently of their motor impairments.





**Figure 7: P9 showed us how he presses key combinations while using the mouse when he draws. Repositioning the mouse takes him long, but being able to press key combinations is important for his practice.**

Figure 7 shows a hand manipulating a mouse on top of a laptop keyboard.

**4.2.1 Internal perceptions:** The complexity of the perceptions of self-identifying as an artist and disabled were reported by our participants. P9 envisioned technology to assist him more with the graphics creation. Still, he wanted to retain the final decision over what the technology was doing, “AI could do the things we ask, and we need. [...] and maybe correcting my mistakes the same way autocorrect works. Sometimes when I type a mistake, the computer suggests fixing it, you know? It doesn’t correct it directly.”

P11 also mentioned an auto-suggestion feature where they would decide when to receive assistance drawing: “I hope AI can recognize the path you want to draw, what you really want, and what you don’t. Like in Office Word, that automatic correction feature? If you make a mistake with a word, it corrects it based on the context. It’s a similar function. You would click between options.” In Figure 11, they show the position where they would place this setting.

A common theme among participants talking about their produced artwork in relation to their sense of self-worth as an artist. In particular, our analysis is that this theme proves how well they manage the restrictions tools can impose on their artistic production. When talking about her identity as an artist, P6 described her work: “I just really liked that aesthetic. Like I didn’t go to art school or anything. I’m. I’m completely self-taught. I... I barely took an art class in high school. I taught myself everything off the Internet and from my own. Just Googling stuff and researching stuff all by myself.”

Similarly, P15 said: “Because they’re all self-taught skills, I don’t know [...] Personally, I haven’t gone deeply into learning [tools on

Adobe Illustrator], and I just use some basic keys or operations [...] what I’ve learned and drawn are all very basic. [...] It’s a state of not knowing how to start, just following some tutorials on the phone, how they operate, and I mimic that process trying to learn from it.”

More bluntly, P5, a professional graphic designer with cerebral palsy, told us “I do everything: Select. Cut. Paste. Change color. Look at this logo I designed. I do everything but drawing. To make a point, he demonstrated his drawing skills by drawing a circle, as seen in Fig. 8.

**4.2.2 External perceptions:** Managing the self-worth of the artwork produced was in friction with how others might see their output. Participants shared how they navigated their relationship with the rest of the world. When discussing with P4 about the ways that one way to improve her speed editing graphics could be using her voice, she started showing hesitancy about how others would see it: “But as for selecting like hotkeys and stuff, I think I would benefit from voice. The.. the thing is... it would have to be in a way that is almost like a headset. Rather than a speaker. Hum... And the reason being is... is when you live in a house with other people, it’s hard to vocalize, a lot, all the time. [...] It’s going to sound like I’m talking for, like, a couple of hours, but... Right? I could see how that would get a little annoying.”

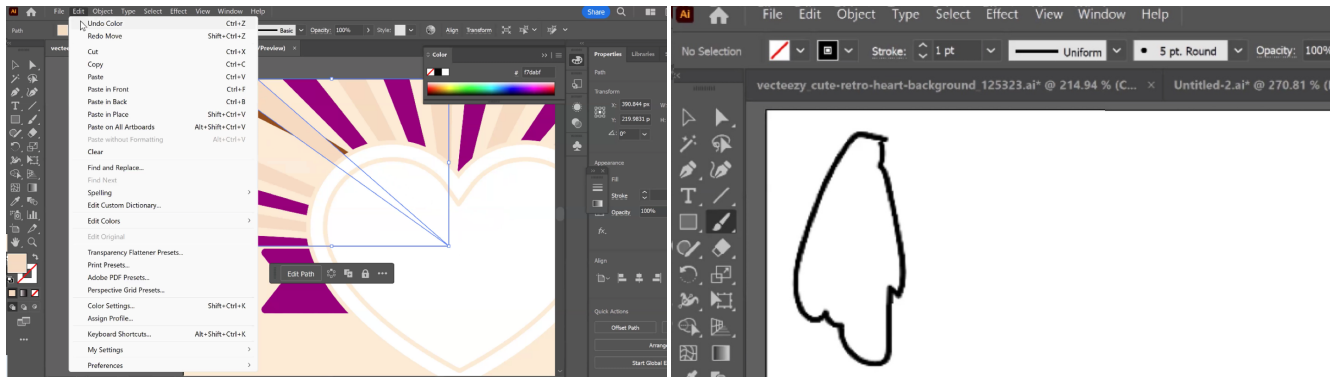
Their artistic production reflects their worth as an artist, and this sense of independence is particularly vulnerable if they feel they will be dependent on others. P9 revealed how vulnerable this sense of independence is when describing why he was not keen to explore accessibility features within his computer: “I know some extra functions exist, but I don’t use them. I have changed them in the past, looking at instructions online. But it made me feel silly, I had to ask for help to fix the settings because I couldn’t turn them off by myself.”

As an artist, the perception of how others see them is through their creative output. In several instances, participants revealed their wish not to jeopardize their relationship with the rest of the world because of their motor impairment. For example, P15 narrated that she uses her computer differently depending on location: “Usually, I use an assistive device at home. [...] Later on, I found it inconvenient to operate with my mouth when in public places. So, I started carrying a pen with me and used the pen to press several keys. I specifically used the pen as my tool [when outside].” She later shared a picture of the custom-made AT she uses at home, shown in Figure 9.

### 4.3 Theme #3: Impact on creative processes

Prior work has explored how people with motor impairments use computers for digital art, and there are well-characterized perceptions surrounding art and disability [8]. Nevertheless, the challenges our participants experienced significantly impacted their artistic practices.

**4.3.1 Inspiration, flow, and interruption:** The required focus required for the inspiration and flow during the artistic processes, is disrupted by the interruptions the accessibility challenges artists with mobile impairments find. The literature often talks about artistic creation as sensitive to inspiration [1, 4, 7, 10]. When asked when he usually draws, P10 answered: “Um. As I said, you know, I just like it... I really enjoyed doing it because... Maybe when I really



**Figure 8: Two screenshots from P5 demonstrating his computer use: Editing graphics through the navigation of menus, which are very extensive and complicated to navigate (Left). The result of his demonstration doing a hand-drawn circumference without pre-made shapes (Right).**

Figure 8 shows two pictures of a software for editing graphics, with the one on the right displaying a shape that is clearly not a circle.

*feel happy, you know, and I want to express how I feel.” Only to, minutes later, tell us “I can make a lot of mistakes, you know? And this kind of mistake actually frustrates me because I know that, and I have a kind of bitterness. If I’m so full of joy, I won’t be able to make that kind of mistake. And kind of, like, frustrates me at times.”*

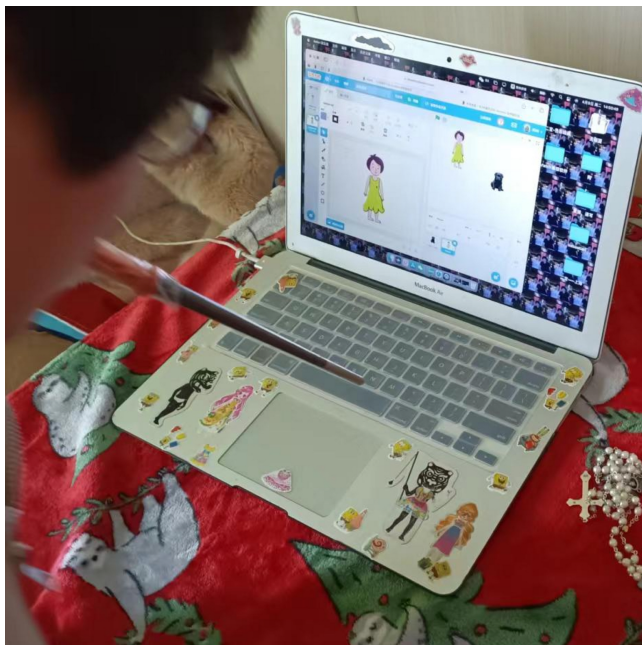
We can read in P11’s description of their interrupted creative joy, with the particularities of their body reactions to excitement “It’s

*a kind of physical reaction. I can’t control it. Hmm. Especially when you’re feeling happy. Drawing happily. Writing happily. Sometimes, when emotions arise, they will shake. [...] When inspiration strikes, of course, you hope it can proceed without constraints [...] Sometimes it’s cumbersome. Then it interrupts my enthusiasm for drawing. It’s an experience, a rather unpleasant one.”*

A similar situation arose when P12 demonstrated her design skills with 3D, while narrating the process she was going through: “I choose a rectangle, then a triangle, as it’s logical. And I have to put, uhm, put this, triangle on the rectangle, they should be aligned. But I can’t just align all at once, I have to drag it in several times. [...] Now again, and it’s still inaccurate. I have to adjust it several times. [...] Sometimes I get nervous, which makes it worse. It’s very difficult to align all at once. [...] Small steps. With strategy.” After demoing the alignment process, P12 had to rest to continue with the interview.

P10, who operates the keyboard and mouse with one hand, told us how often different options of the software interface distract him, stating that his main problem is he often loses focus when drawing “sometimes when using the software, there are a lot of options, and it’s kind of... it gets confusing. Sometimes you don’t know which particular one to use.”

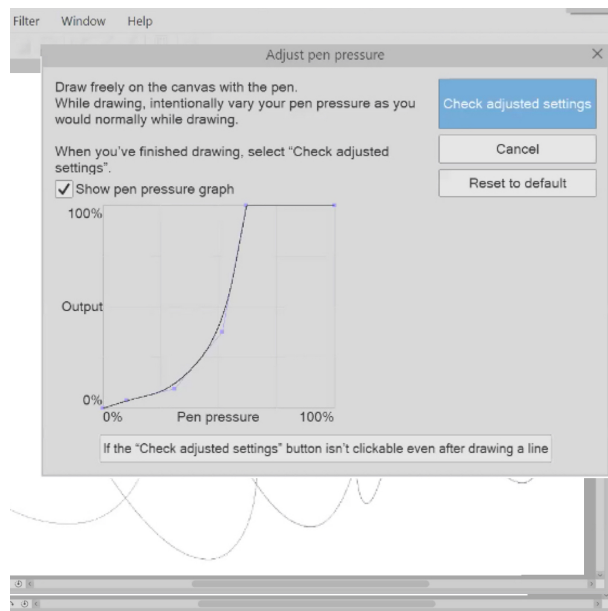
P15 continued describing her art experience, making a parallel between the digital and the physical creative processes, narrating how using digital means was a source of distractions and inconveniences. “[I’ve tried [using only the touchpad, to stay in the flow]. I divide my upper lip, lower lip, and tongue into three parts. For example, Ctrl + Z + A, I split it into three parts and pressed them together. So, pressing three keys together is the most difficult for me. For example, if they are far apart, I will use one hand to reach for the distant key, and then use my mouth to control the other two keys.”



**Figure 9: P15 using custom AT to operate the touchpad and keyboard of her laptop (A conductive plastic toy stick which P15 repurposed to press keys on her computer).**

Figure 9 shows a person holding a long stick with their mouth, and in front there is a computer with a simple cartoon drawing of a child.

**4.3.2 Artistic Ownership:** The value our participants put on ownership when choosing tools that helped them with their processes challenged their role as creators. When talking with P15 about the experience of wearing a head pointer, she acknowledged it could relieve the discomfort caused by holding a stick with her mouth. See Fig. 9 for reference. Nevertheless, she expressed the importance of being able to work with a computer at her will: “For



**Figure 10: Sensitive customization that allows P6 to adjust the pressure she applies to her stylus.**

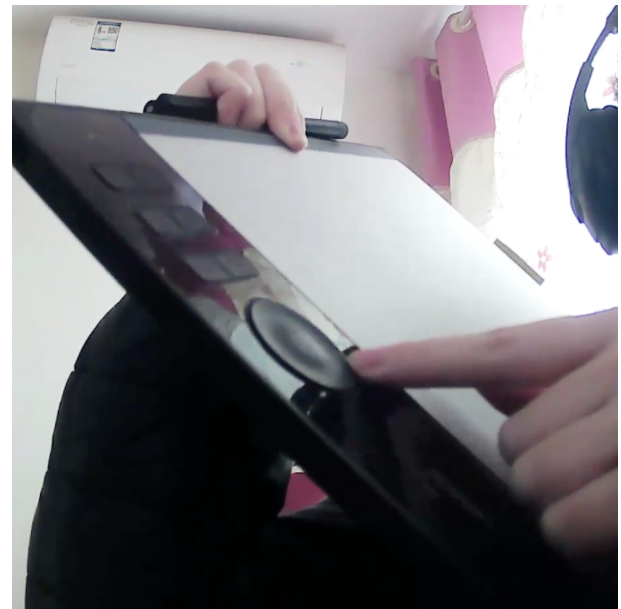
Figure 10 shows a computer menu which says “Adjust Pen Pressure,” with instructions about how to calibrate the parameters. A drawing of two axis showing pen pressure vs output is shown as well.

*example, if I want to work on my computer, I must find someone. It's not that asking someone for help is bad, but it's just a constant bother to ask someone to help me put it on and take it off when needed.”*

In many cases, digital artists with motor impairments use templates to produce their visual artworks (an example can be seen in Fig. 3). P1, P13, and P15 showed us their usage of these templates, which allowed them to produce work by selecting options from existing models. Through their processes, they expressed their satisfaction with the results obtained. When imagining possible solutions that could improve accessibility challenges, P14 reflected on how he uses templates and how satisfied he is with the interaction, but not with the limited choices the templates offer: *“For me, the clicking is enough. That's what I need. The software, the functions, if it can have -maybe more detailed- functions, I can use them”*

P14 said, while showing us how he uses templates to make advertisement posters *“every year I will change my press of the after the cost and. It's very easy, actually. If this is just simple and easy, I cut, I put lines, rectangles, or circles. It's easy to draw. But if there's more detail and accurate action, it's just very hard.”* Continuing the conversation with P14 about other technologies which could enhance the creation and speed, he mentioned *“[voice commands] is useful, but just not very necessary. Because, for example, the software can take my speech to the [written] words. But I think, maybe I can type on the keyboard. Not very quickly, but it is enough.”*

P14 emphasized the rejection of using voice commands, where he did not see the added value of adding extra technology to speed up a process he could already control. Nevertheless, he later also



**Figure 11: Dial on P11's digitizer tablet, which they use to speed tool selection.**

Figure 11 shows a digitizer tablet, and someone is posting at a wheel-like dial it has on the center.

said *“In the future, I can just tap some of my requirements into the software, and AI can translate into the paintings or movies, without a limitation of some models.”* We understand his comment as referring to the imposed limits of using fixed models, which one day could be responsive and customized to his needs.

When talking about controlling the computer with his gaze, P14 told us something contradictory: *“I don't need that. I don't need those. Some of my friends, after their injury, I saw them using it. Some used to use their eyes to tap. I think if I go out and try an eye-track device, it would make it much easier to draw. I have not looked for a tool like that because I don't think it is very necessary for me.”* This comment acknowledges that he knows how eye tracking could benefit him, yet he seems to minimize its possible utility. We interpret this answer as a contradiction, with P14 saying technology could allow him to draw faster while stating he does not need it as much as other people.

When discussing her identity as an artist, P6 shared her experience of finding the right AT, which allowed her to produce digital art pieces she could not otherwise. P6 said *“It's really hard being disabled and wanting to be an artist because all this stuff is expensive. All this digital stuff is really expensive. The programs are getting more and more expensive,[...] even now are subscription based.”*

P6 also shared how she thought equipment and software affordability affected the chances of being an artist: *“Disabled artists don't have very much money either. It's very difficult to try to get into the digital art world if you're it. It's difficult. Because it opens up so much for a disability. There's so much potential here. But it's difficult to*



*break into it.” To what she added, later in the conversation: “Maybe someday there might be some kind of grant or something for disabled artists.”*

**4.3.3 Relationship between frustration and losing motivation to produce art:** There is a close relationship between the output artists can produce and how they relate to the rest of society. All participants mentioned the joy of creating artwork and what inspired them to make art, with eight stating how important the activity was for their finances or professional development.

Nevertheless, of the 15 participants, nine expressed that accessibility challenges impacted their productivity and diminished their motivation to produce artwork. P4 carefully narrates how these frustrating experiences disrupt the creative processes and erode the motivating factors to create artwork.

When showing us a digital painting she was working on, and discussing the dedication that producing artwork required, P4 shared with us *“I got a lot of progress on [the artwork] and then I just dropped it because [...] holding sticks and anything related to a pencil is strenuous. I find in more recent times, I have to limit my time to about 20-minute intervals. And I find it also.. also carries into my work. [...] This action really hurts this side of my hand. So, beyond just the art side, it affects my job side as well.”*

We can see that P4 explains the physical challenge of drawing with the stylus and how it has affected the motivation to produce artwork. P6, who is a prolific professional digital artist and disability advocate, described this when she told us *“drawing with a tablet was the thing that really worked for me was the pressure sensitivity. [...] And that’s my main accessibility thing. That changed everything. It changed the whole game for me because [...] suddenly, I could draw way longer. I can draw way more easily, which is so much better for my hands, my wrists, and everything. [...] If it wasn’t for, you know, the computer, there was no way.”* The sensitivity settings she refers to are shown on Figure 10.

In a different scenario, P10 finds that in his daily job as a graphic designer, the challenges of navigating the menu options of the drawing software without the chance of using keyboard shortcuts increase his production time to an extreme: *“It takes too long for me. Because sometimes, if I start a piece and my own, I might actually forget why I started it. So it takes a really long time. Sometimes it takes me days to complete it.”*

During the interview P5 showed us his proficiency in setting up his computer inputs configuration with a trackball, adjusting the sensitivity for coarse and fine movements, configuring his keyboard on the floor, and fluently using sticky keys. However, he was reluctant to think that new technology would improve his ability to draw. When asked if there was anything he could imagine as a better solution to his current setup, he expressed frustration with a simple *“I tried everything. Nothing works.”*

## 5 Discussion

We organize our discussion on three main points: the impact of accessibility challenges on artistic processes, how agency over tools defines artists’ identities, and the challenge of finding the right artistic technology.

### 5.1 Accessibility Challenges Impact on Artistic Processes

Accessibility challenges disrupt artistic processes, making it difficult to maintain flow and motivation. We found that participants associated barriers to sustained artistic engagement with interruptions, lengthy workarounds, and physical discomfort of using graphic input devices. Participants expressed frustration over the limitations of the accessibility features they use and the steep learning curve associated with new tools, which further impedes their ability to realize their creative visions. Prior work confirmed our results, pointing out that disrupting obstacles significantly impacts creative processes [7, 10, 22]. If researchers really mean to create more equal opportunities, we need to understand the implications that managing pain and discomfort can bring to the artists.

The fact that a digital artist with a motor impairment needs to align and re-align a line several times or has to navigate through highly complicated menus to choose a colour can bring consequences that exceed the limits of the quality of the artistic production. The lines might not be perfectly aligned, or setting the colour might take extremely long, but it also brings frustration and distraction to the creative person trying to imagine a piece of art. The message the artist might have thought at the beginning now has less chance of becoming real, and with each obstacle, we are one step farther from having a process of engaged and motivated creation.

Our findings support the idea that evaluating the artists’ identity and the self-perceived quality of the artworks produced is crucial to designing successful solutions. Considering creative processes will enhance usability without compromising artistic expression. We recommend that researchers co-design prototypes in collaboration with artists. Paying close attention to the artistic processes. For example, new prototypes could be tested not only for overcoming accessibility short-term obstacles but also for creative artistic output as perceived by the artists.

### 5.2 Agency Over Tools Define Artists’ Identities

The way creators can control their tools reflects how important it is for artists to keep artistic ownership. Participants wanted to leverage technology without feeling constrained by complex configurations or limited options. In other words, some of the tools and templates they used led to a feeling of not being the real author of the visual output. These obstacles were not inherent to the tools themselves but much more about how their usage felt limited due to preconceptions of what art is and how “real” artists would not need templates. This finding is in line with the current work scholars are doing about AI co-creation tools for visual arts [18, 32].

It is also interesting to bring into conversation research about how the creative processes need recognition and reflection [10]. And that existing literature has examined the link between the identity of being an artist and being disabled [22, 25, 28, 30]. Using templates and automatic tools by a body-abled visual artist might not have the same connotations as someone who lives with motor impairments. Implicitly, the tool acts as a metric of the effort to create it, and there is a perception of the value the society will fix to the artwork produced.

We found that participants assigned importance to artistic ownership, associating tools' limitations to the detriment of the quality of the artworks produced. In contradiction to this finding, participants also imagined solutions such as AI-powered tools, which would assist in improving and speeding up their creative processes. For example, P13 imagined an AI solution to "remove the limitations" of existing fixed templates. The identity of being an artist with upper limb motor impairments is closely intertwined with their ability to navigate tools that enable their creative expression. We wonder how to balance artistic ownership with the agency over tools that allow workflow automation.

### 5.3 Finding The Right Artistic Technology

We observed that participants encountered challenges in finding the right tool, often exceeding the technical requirements or the immediate accessibility obstacles of the user. Many participants revealed that they minimized the risk of attracting undue attention to their disabilities. As examples of this struggle, we can cite the story that P15 shared about carrying a pen to press keys without attracting too much attention, in the same way, P4 or P14 were reluctant to use some accessibility features given how others would perceive them. Creed has observed the importance of normalcy within artistic communities in 2018 [8]. Our results reiterate that the aesthetics of tools and software interfaces play a critical role in fostering a sense of inclusion.

Visual artists follow creative processes that diverge from those in performative arts. When considering their self-perception and identity, we acknowledge that their creation process, such as painting or drawing, is not necessarily aimed at engaging an audience. Instead, visual artists' primary focus is on the artwork produced. In this context, we question how accessible artistic technologies should be designed to embody the concept of "normalcy" as referenced by Creed.

### 5.4 Limitations

Acknowledging these limitations is essential for contextualizing the study findings and informing future research directions to address the accessibility needs of digital artists with Upper Limb Motor Impairments more comprehensively.

**Sample Size:** The study's sample size of 15 participants, while providing valuable insights into the experiences of digital artists with Upper Limb Motor Impairments, may not fully capture the diversity of perspectives within this population. As such, the findings may not be generalizable to all individuals with similar impairments.

**Recruitment Bias:** Participants were recruited through posters, email, and social media, which may have introduced a selection bias favouring more technologically savvy individuals or actively engaged in online communities. This could limit the representation of individuals with varying levels of familiarity with digital drawing tools.

**Possible Fraudulent Participants:** During the interviews, we noticed that two participants had strong inconsistencies when describing their lived experiences of a digital artist with a mobile impairment. One participant showed photorealistic artwork that did not match the definition and colour resolution capabilities of the software demonstrated. Another incorrectly described the medium

of visual artwork, a digitized version of ink on paper, as a digitally produced drawing. Following the recent guidelines suggested by Paniker et al., we decided to include the data of all the interviews because of the vulnerability of the population this study focused on, and limit the risk of excluding participants because unverifiable ineligibility criteria [24].

**Self-Reported Data:** The collected data relied primarily on self-reported experiences and participants' perceptions, which may be subject to recall or social desirability biases. Participants may have underreported certain challenges or adapted their responses to meet perceived expectations. Additionally, we did not collect sufficient details to make our findings more generalizable.

**Technology Limitations:** Conducting interviews remotely via Zoom may have introduced technical challenges or limitations, such as connectivity issues or difficulties in effectively demonstrating how they use digital drawing tools. These factors may have impacted the richness and depth of the data collected.

**Researcher Bias:** Despite efforts to maintain objectivity, researchers' interpretations and biases may have influenced the analysis and understanding of the data. We used reflexivity and transparency in the research process to mitigate potential biases.

## 6 Conclusion

In this study, we interviewed fifteen digital artists living with upper motor impairments to uncover their challenges when utilizing computers to draw, the adaptive solutions they employ, and the impact on their creative processes. We used thematic analysis to code the data, and three clear themes emerged: challenges in artistic production, internal and external perceptions, and the impact on the creative processes. We structure our discussion around three key aspects: the influence of accessibility challenges on artistic processes, the role of tool agency in shaping artists' identities, and the challenges of identifying appropriate artistic technology.

Future work can explore innovative approaches to enhancing tool usability and supporting the diverse needs of artists with disabilities in the digital art landscape. Observing the artists' creative computer spaces and studios in person would play an essential role in understanding the true creative workflow in a real-world context. While our study adopted a cross-sectional design, a longitudinal approach could offer deeper insights into the evolving accessibility needs and challenges artists face over time. This longitudinal perspective would show how artists with motor impairments adapt and integrate new artistic technologies into their creative processes.

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## Appendices

### A Interview Questionnaire

#### A.1 Drawing

These questions focused on the way that users experience sketching, drawing shapes, and coloring.

- What kind of graphics / artwork do you produce?
- Do you have samples of your drawings you would like to show?
- When do you usually draw with your computer?
- How do you usually draw?
- Which software tools do you use?
- Which kind of input device(s) do you use?
- What challenges do you find when drawing? (or dislike)

#### A.2 Editing

These questions focused on the experience of manipulation of existing graphics such as deleting, moving, recoloring and reshaping.

- What kind of graphics do you need to edit?
- When do you need to edit graphics?
- How do you edit them?
- Which software tools do you use
- Which input device(s) do you use?
- What challenges do you find when editing? (or dislike)

#### A.3 Input Devices

This set of questions will focus on the challenges associated with using input devices for the input and manipulation of graphics.



Participants will be asked to show the ways they use their pen for the Drawing and Edition tasks mentioned above.

- Can you show us how you use your input device to draw?
- Can you describe the way you use it/them?

#### **A.4 Demographics**

- What is your age?
- What is your gender?
- What is your highest education?
- What is your country of residence?
- Can you tell us about your upper limb impairment or condition affecting the upper limbs which impacts your ability to use the computer? (for example arthritis, hemiplegia, ALS, amputation, tremors, etc.)?
- Can you describe your impairment?
- How long did you have it?

#### **A.5 Computer Usage**

- Can you tell us about how you use your computer to draw or edit graphics?
- How many hours per week do you draw or edit graphics?
- What computer(s) do you use?
- What do you use to draw or edit graphics with your computer (mouse, stylus, digitizer tablet, etc.)

#### **A.6 Solutions**

These questions will ask participants about their experiences finding workarounds and hacks that made using their current input methods more usable.

- Which accessibility features do you use?
- Which configurations (like key combinations or external)?
- Why do you use them? Why don't you?
- Which solutions didn't work for you?
- Are there tasks you cannot solve by yourself?

#### **A.7 Future Assistive Devices**

These questions will focus on understanding user needs and imagining future assistive technologies for graphic input devices.

- Can you imagine other technology that could help you draw/edit?
- In which context would you use it?
- Which functions would it have?
- Which shape would it have?

## B Final Codebook

### B.1 Theme #1: Challenges in Artistic Production

Code	Freq.	Examples
<i>Subtheme 1: Managing Pain, Discomfort, or Injuries</i>		
shape of input device	9	"that was right at the very beginning. When his left hand was still weak. Now I'm strong enough to operate the computer, but I never got back to the speed I used to have [...] "when it comes to my iPad, the one I use to draw, the pen isn't really great. It's actually really uncomfortable to hold in the hand and it doesn't really have like a. A really firm grip when you try to hold it. It kind of like slips a lot" (P7)
evolution from rehab	2	
impairment	15	"I wear a brace. But with the brace, it's really hard for me to grip on to my stylus; it makes drawing really uncomfortable" (P4)
injuries related to drawing	3	"I need to be consistent about that because if I push myself too hard, I can get injured if I draw without taking enough breaks." (P6)
pain management	3	"It's way more comfortable with the wider pan is the one that I choose to use. I think it works a little bit better for me. I really enjoy working with mouse, I can tolerate a bit of pain" (P3)
pain tolerance	3	
pain related to drawing	3	"My dominant hand holding pencils is painful. Holding sticks and anything related to a pencil is strenuous. And I find in in more recent time, I have to limit my time to about 20 minute intervals." (P4)
<i>Subtheme 2: Workarounds for Artistic Production</i>		
software accessibility features	9	"It affected my fingers because I find that there is no way I can use one finger to use control while pressing shift to perform that jobs. Which means I got to use my two hands to perform tasks. So yes, keyboard gives me this challenge due to this magical laptop that I wanted to work with the keyboard." (P3)
key shortcuts	8	
multimodal	6	" I use the mouse pointer to try to select the correct background color, but it's a major improvement compared to click on the menu and choose the option. It's much easier with the key shortcut using the mouse, with the touchpad I can't reach the correct key combinations." (P9)
speech control	7	"You could voice commands. I think it would actually be really good for layer swapping because because that's something I find that takes a lot of time" (P4)
new interfaces	11	"Whenever I pass by an arcade, I think about this. It's what I imagine: using a mat as a mouse and keyboard for my computer." (P15)
workarounds to minimize pain	6	"The thing with drawing with a tablet was the thing that really worked for me was the pressure sensitivity. Just like drawing with pencil is you can change the pressure sensitivity to be really light. That's my main accessibility thing. That changed everything. It changed the whole game for me because if I changed the pressure sensitivity to be really light, then I don't have to press down so hard and suddenly I can draw way longer. I can draw way easier, which is so much better for my hands, my wrists, everything. I'm not injuring myself so much and I can draw these beautiful pieces like you can see on my website and. I could never do that." (P6)

Code	Freq.	Examples
<i>Subtheme 3: Unhelpful, Unknowns, and Unavailable Solutions</i>		
unhelpful or complicated solutions	10	"It was more awkward because of the position, because I'm used to this, but that it, it forced my fingers to do this. It did alleviate pressure on my fingers, so it was beneficial a little bit. But as for drawing, it was hard for me to place my lines where I want them to go. Um, it was hard for me to. It's just a different feeling." (P4)
using existing accessibility features	9	"Finding something in the control center on an iPad, is quite easy. You can find some functions here directly, like settings and so on. There's an accessibility button. It's quite convenient." (P13)
try new accessibility features	9	"I'm completely self-taught. I barely took an art class in high school. I taught myself everything off the Internet and from my own. Just Googling stuff and researching stuff all by myself." (P6)
learning a new solution	8	
If I am not imagining too much	3	"from my imagination I would love something like an assistant that can choose better commands. Like show me options and select them for me, please. Maybe I have maybe like an image of my dog that I wanted painted. So like I want that part of the tail to be recolored. Can you put, like, white color? If I am not imagining too much (P8)
never tried these sci-fi features	6	

## B.2 Theme #2: Managing Perceptions

Code	Freq.	Examples
<i>Subtheme 1: External Perceptions</i>		
impact on value of the artwork produced	1	"Because my hand function isn't very good, sometimes I make mistakes. For example, importing pictures, then ... [he explained the process] ... That's it. This feature is quite powerful, it has filters, adjustments, stickers, text, and special effects. It also has [...] features that are quite robust. For amateur photo editing like me, it's sufficient. Because I'm not a professional." (P13)
seek for help	1	"Also another method where they wear something like a helmet with a stick in front, which I can use to tap the keyboard. But I've tried this method, and because I need assistance to put something on my head, it's inconvenient for me. [...] For example, if I want to walk to my computer, I have to find someone." (P15)
disability not associated to art production	2	"On the website there are many models. I use the model, some that for free. I use the free because it's enough. And here is the Excel. Okay. For example, I can change the number of the price. I use my keyboard, adapt the existing text. What I end up doing is very limited." (P14)
financial burden	6	
support from others	2	"It's not that asking someone for help is bad, but it's just a constant bother to ask someone to help me put it on and take it off when needed. So, for me, it's not that convenient." (P15)
insecure about future solutions	5	
computer aided drawing	2	"On the website there are many models. I use the model, some that for free. I use the free because it's enough. And here is the Excel. Okay. For example, I can change the number of the price. I use my keyboard, adapt the existing text. What I end up doing is very limited." (P14)



### B.3 Theme #3: Impact on Creative Processes

Code	Freq.	Examples
<i>Subtheme 1: Inspiration, flow &amp; interruption</i>		
artistic drive	13	"There instances of a kind of more you find it difficult to do express myself, drawing helps me to connect beyond my disability." (P2)
resilience and distraction	12	"I usually would draw about three times a week. But but given that I can't do it for long periods of time in one sitting, I lose interest in what I'm working on. So as for publishing anything, I'm getting zero done" (P4)
focus and persistence	15	
<i>Subtheme 2: Artistic ownership</i>		
AI assisted drawing	13	"Basically what you can do with this software is to edit the already existing software and make it look better to your taste. And it works, it just outputs something that actually can suits your purpose." (P1)
support from others to learn	1	"I would try to solve it by myself, but if I can't figure it out I would call I'll call my brother and ask what kind of find the phone. As I never received formal training, I sometimes get lost on how to make an effect or a style and he always helps me" (P8)
use of premade models	3	"My needs exceed what the pre-made tools offer and I should draw instead, but my ability to move my hands is limited. So I end up without the pre-made models and without the ability to free draw what I want to communicate." (P14)
<i>Subtheme 3: Relationship between frustration and losing motivation</i>		
hopes for solutions	4	"I think I would benefit from a product that could add pressure to the pencil. So it feels natural but alleviates, like, weight on these specific fingers." (P4)
motivation	3	