Wearable Identities: Understanding Wearables’ Potential for Supporting the Expression of Queer Identities

by

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Abstract

Queer identity research largely overlooks wearable technology. Most work exploring sociocultural considerations of wearable technology determines what is “socially acceptable” based on privileged bodies, excluding queer perspectives. We address this by establishing the foundations of a knowledge base for wearables that support queer expression. We conducted a two-phase qualitative study exploring queer expressive practices and wearable technologies through 16 semi-structured interviews and 15 body mapping workshops with the queer community. We observed themes framing the queer community’s understanding of queer expression, wearable technology, and wearable technology for queer users. Providing discussions on current trends in queer expression and wearable technology use, along with design considerations, our work enables the creation of wearable technologies that offer meaningful user experiences for the queer community.

CAUTION: This paper discusses topics that could trigger those with histories of homophobia, transphobia, gender dysphoria, racism or eating disorders. Please use caution when engaging with this work.
Acknowledgements

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Table of Contents

Abstract ............................................................................................................................. ii
Acknowledgements .......................................................................................................... iii
Table of Contents ............................................................................................................... v
List of Tables ..................................................................................................................... ix
List of Figures .................................................................................................................... x
List of Appendices .......................................................................................................... xii
Glossary .......................................................................................................................... xiii

Chapter 1: Introduction ................................................................................................... 1
  1.1 Overview ......................................................................................................................... 1
  1.2 Research Questions ......................................................................................................... 3
  1.3 Contributions ................................................................................................................... 4
  1.4 Thesis Outline ................................................................................................................. 5

Chapter 2: Background and Related Work ................................................................... 7
  2.1 Queer Identity Management and Expression ................................................................. 7
      2.1.1 Relating to the Bodies................................................................................................. 7
      2.1.2 Queer Semiotics ...................................................................................................... 8
      2.1.3 Queer Identity Management Technology ................................................................. 10
  2.2 HCI Considerations for the Queer Community ............................................................. 12
      2.2.1 Queer HCI .............................................................................................................. 12
      2.2.2 Designing for Queerness ...................................................................................... 14
  2.3 Wearable Design: The Role of Aesthetics and Wearability ........................................... 16
      2.3.1 Aesthetics .............................................................................................................. 16
      2.3.2 Wearability ............................................................................................................ 17
  2.4 Social Considerations for Wearable Design ................................................................. 18
3.2.3.1 Avenues for Digital Queer Expression ............................................................ 50
3.2.3.2 Expressive Modifications for Digital Devices ............................................... 51
3.2.4 Summary of Phase One Findings ........................................................................ 52

Chapter 4: Study 2: Body Maps .................................................................................... 54
4.1 Methodology ........................................................................................................... 54
4.1.1 Participants ......................................................................................................... 54
4.1.2 Data Collection .................................................................................................. 56
4.1.3 Data Analysis ..................................................................................................... 59
4.2 Findings .................................................................................................................. 60
4.2.1 Queerness and Expression ............................................................................... 61
4.2.1.1 Framing Queerness .................................................................................. 62
4.2.1.1.1 Queer Lived Experiences .................................................................. 62
4.2.1.1.2 Other Identities .............................................................................. 64
4.2.1.2 Framing Expression ............................................................................... 65
4.2.1.2.1 Barriers to Expression .................................................................. 65
4.2.1.2.2 Outcomes of Expression ................................................................ 67
4.2.1.2.3 Factors Impacting Expression ....................................................... 67
4.2.1.3 Designing for Expression ......................................................................... 69
4.2.1.3.1 Techniques for Queer Expression ............................................... 69
4.2.1.3.2 Considerations for Expression ....................................................... 71
4.2.1.3.3 Queer Semiotics .......................................................................... 72
4.2.2 Queer Bodies and Expression ......................................................................... 73
4.2.2.1 Framing Queer Bodies .......................................................................... 74
4.2.3 Envisioning Wearables for the Queer Community .......................................... 83
4.2.3.1 Wearables for the Queer Community ................................................... 83
4.2.3.1.1 Queer Wearable Solutions ............................................................ 84
4.2.3.2 Designing the Wearables ................................................................................. 93
4.2.3.2.1 Desired Wearable Qualities ........................................................................ 93
4.2.3.2.2 Barriers to Wearables .................................................................................. 96
4.2.4 Summary of Phase Two Findings ............................................................................. 98

Chapter 5: Discussion ........................................................................................................... 100
5.1.1 On Understanding Queer Identities and Expression ............................................... 101
5.1.1.1 Queerness and Fluidity ................................................................................... 101
5.1.1.2 Queer Aesthetics ............................................................................................ 102
5.1.2 Design Opportunities for Queer Wearables ............................................................ 103
5.1.2.1 Functionality versus Expression ................................................................. 104
5.1.2.2 Customizability and Adaptability ................................................................. 105
5.1.2.3 Accessibility ................................................................................................... 106
5.1.2.4 Safety ............................................................................................................. 107
5.1.3 Body Mapping as a Queer Research Activity ......................................................... 108

Chapter 6: Conclusions ........................................................................................................ 111
6.1 Research Questions Revisited ..................................................................................... 111
6.2 Future Works and Limitations ................................................................................... 112
6.3 Conclusion ................................................................................................................... 113

Appendices ........................................................................................................................ 114
Appendix A Ethical Clearance ................................................................................................. 114
A.1 Consent Form for Interviews .................................................................................. 116
A.2 Consent Form for Body Mapping Workshops ........................................................ 119
Appendix B Interview Study Script ......................................................................................... 123
Appendix C Body Mapping Study Script ................................................................................ 125

Bibliography or References ................................................................................................. 128
List of Tables

Table 1 – Study 1 Participant Demographics .................................................................24
Table 2 – Wearable Styles Shared by Participants .........................................................32
Table 3 – Frequencies of Items and Techniques used for Queer Expression ...............45
Table 4 – Frequencies of Items and Techniques used for Gender Expression .............46
Table 5 – Design Considerations for Queer Expression ..............................................48
Table 6 – Study 2 Participant Demographics ...............................................................55
Table 7 - Frequencies of Items and Techniques used for Queer Expression ...............70
Table 8 - Design Considerations for Queer Expression ..............................................71
List of Figures

Figure 1 - Pride Progress Flag (Left), Leather Pride Flag (Right) ..........................................9
Figure 2 - Pink Triangle (Top Left), Labrys Flag (Top Right), Lambda (Bottom Left), Transgender Symbol (Bottom Right) ................................................................................10
Figure 3 – Phase One Study Structure ................................................................................26
Figure 4 – Thematic Relationship of Interview Findings ......................................................29
Figure 5 – Thematic Relationship between Themes for Wearable Use and Design ............30
Figure 6 – Thematic Relationship between Themes for Queerness and Expression ..........39
Figure 7 - Thematic Relationship for Wearables and Expression Themes ..........................50
Figure 8 - Phase Two Study Structure ...............................................................................57
Figure 9 - Thematic Relationship of Body Map Workshop Findings ..................................61
Figure 10 - Thematic Relationship between Themes for Queerness and Expression .......62
Figure 11 - Thematic Relationship between Themes for Framing Queer Bodies ...............74
Figure 12 - Front and Back Heat Maps of "Queer" Body Features ....................................75
Figure 13 - Front and Back Heat Maps of "Queer" Bodily Sensations .................................76
Figure 14 - Front Heat and Back Heat Maps of "Queer" Mental and Emotional Sensations .............................................................................................................................77
Figure 15 - Front and Back Heat Maps of Body Parts for Queer Wearables .....................78
Figure 16 - Front Heat and Back Heat Maps of Technological Input on Queer Bodies ...79
Figure 17 – Front and Back Heat Maps of Technological Output on Queer Bodies ...........80
Figure 18 - Front and Back Heat Maps for Biological Input on Queer Bodies .................81
Figure 19 – Front and Back Heat Maps for Biological Output on Queer Bodies .............82
Figure 20 - Thematic Relationship between Themes for Envisioning Wearables for the Queer Community .................................................................83

Figure 21 - PB14 Future Body Map ..............................................................................................................................84

Figure 22 - PB08 Future Body Map ..............................................................................................................................85

Figure 23 - PB01 Future Body Map ..............................................................................................................................86

Figure 24 - PB10 Future Body Map ..............................................................................................................................87

Figure 25 - PB02 Future Body Map ..............................................................................................................................88

Figure 26 - PB06 Future Body Map ..............................................................................................................................89

Figure 27 - PB07 Future Body Map ..............................................................................................................................90

Figure 28 - PB12 Future Body Map ..............................................................................................................................91

Figure 29 - PB05 Future Body Map ..............................................................................................................................92
List of Appendices

Appendix A Ethical Clearance……………………………………………………… 114
A.1  Consent Form for Interviews……………………………………………………116
A.2  Consent Form for Body Mapping Workshops………………………………119
Appendix B Interview Study Script………………………………………………123
Appendix C Body Mapping Study Script……………………………………… 125
# Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>2SLGBTQIA+</td>
<td>Two-spirited, lesbian, gay, bisexual, transgender, queer, intersex, asexual/aromantic, etc.</td>
</tr>
<tr>
<td>Queer</td>
<td>Non-cisgender and heterosexual lived experiences</td>
</tr>
<tr>
<td>Trans*</td>
<td>Transgender lived experiences</td>
</tr>
<tr>
<td>HCI</td>
<td>Human-Computer Interaction</td>
</tr>
<tr>
<td>Privileged Bodies</td>
<td>Physical bodies that are demographic majorities such as white, cis-male, able-bodied, heterosexual, etc.</td>
</tr>
<tr>
<td>AFAB/AMAB</td>
<td>Assigned-Female-at-Birth/Assigned-Male-at-Birth</td>
</tr>
<tr>
<td>BIPOC</td>
<td>Black, Indigenous, People of Colour</td>
</tr>
<tr>
<td>M[L/S]M</td>
<td>Men-who-[love/has-sex]-with-men</td>
</tr>
<tr>
<td>SNS</td>
<td>Social Networking Site</td>
</tr>
<tr>
<td>I/O</td>
<td>Input-Output</td>
</tr>
</tbody>
</table>
Chapter 1: Introduction

1.1 Overview

As of 2018, openly identifying queer Canadians aged 15 and older accounted for an approximate, yet substantial, four percent of the population, a percentage nearly doubling in the United States [70,158]. Despite this growing public perception, queer Canadians continue to have significant quality-of-life concerns due to discrimination and a lack of acceptance [9,30,99,120]. Stigma often makes queer individuals the targets of hate crimes, sexual and/or physical assault and harassment [99]. In Canada, hate crimes motivated by sexual orientation were deemed the most violent of hate crimes and more than doubled between 2007 and 2008 [30,158]. Despite these tragic realities, the queer community continues to practise explicit and diverse methods of personal and community-wide resistance [8,9,30,70,99,120,158].

One of the pivotal aspects of queer lived experiences resides in the expression of one’s sexual and gender diversity. We, the lead researcher (Adrian Bolesnikov) and supervisory members of the research team, must state that when using the term queer, we are not referring to the sexuality label. Instead, we operate with the understanding of queer as “relating to a sexual or gender identity that does not correspond to established ideas of sexuality and gender, especially heterosexual norms” as commonly used in Queer HCI [130]. Queer expression therein lies in the practice of personally connecting to one’s queerness or displaying and communicating it to those in their social environment. Meaningful and authentic queer expression provides individuals with the opportunity to experience a heightened sense of community, individuality, and mental
well-being [2,52,116]. Using mediums like clothing, hair styling, and even tattoos, the body has always been one of the largest canvases for queer expression [13,65,116].

It is then unsurprising that digital technology has begun to support queer expression, particularly with commercial wearable technology (hereinafter referred to as *wearables*) offering increasingly numerous explicitly queer components [157]. Wearables, devices worn on, near or even within bodies [51,148], as an emerging style of technology are particularly fascinating for their extremely varied application potential in fields like healthcare [84], athletics [96], and accessibility [114]. From smart garments to e-textiles, wearables are being explored for their potential to be small, discreet, methods of personalized computing capable of helping enhancing the wearer’s quality of life [51,82,121].

The queer-inclusive nature of commercial wearables, however, is being called into question for its reliance on “rainbow capitalism” through a focus on white, able-bodied, and cisgender queer experiences [41,129]. This often causes certain members of queer communities to become more marginalized by comparison, a factor that can lead to isolation, a feeling of invisibility, and even violence [54,93,142]. This is particularly relevant in the growing calls for designing technology to subvert the marginalization of underrepresented users [41,54,87,93,126,129,142].

Research on queer identity management in human-computer interaction (HCI) has grown in recent years, investigating how queer individuals might navigate the intricacies of queer identity expression and sharing [34,56,57,61]. It has made particular strides investigating the online queer persona, often through topics such as identity disclosure [39,110] and social media usage patterns [5,22,34,56]. Yet, we have noticed a lack of
existing HCI literature investigating queer expression outside of online contexts. Wearables offer a uniquely beneficial approach due to their inherent embodied interactivity, which provides a valuable extension of one’s self through technology outside purely online contexts [105]. Wearable research has long since explored social acceptability by questioning the social relationships between the device, users, and their environments [29,38,40,95,96]. While some work has begun exploring the impacts of cultural practices on wearable design [40], these works largely determine what is “socially acceptable” based on privileged bodies and perspectives [38,47,152]. We have identified a knowledge gap in how wearables can be used as technologies for queer identity expression.

1.2 Research Questions

Given this background, we sought to bridge this gap within queer wearable research by establishing the foundations of a knowledge base for wearable design that more authentically supports queer expression. Haimson et al.’s [59] work in investigating the styles of technologies the trans community desire inspired the motivation of our work. Building off their work, our goal was to influence a shift in more meaningful embodied and expressive design within the wearable industry for the queer community. To achieve this goal, we posed the following research questions:

R1. How does the queer community practice the expression of their queerness?

R2. How can wearables be designed to best support queer expression?

R3. How can body mapping as a research activity generate new knowledge regarding the experiences of queer expression and wearables?
R4. What types of future expressive queer wearables does the queer community envision?

To address these questions, we conducted a two-phase qualitative study exploring queer expressive practices and wearables. In phase one, we first performed semi-structured interviews with 16 queer individuals who shared their experiences and opinions on identity expression, wearable device usage, and digital and wearable expression. During the second phase, we carried out 15 individual body mapping workshops with members of the queer community to gain a deeper understanding of the relationship between identity expression and queer bodies and the potential of future queer expressive wearables. Though different fields use body mapping in many ways in, in HCI, the art-based method is used to kinetically visualize an experience with their bodies to generate information on in-the-moment experiences [25]. We, however, used the method to ideate future technology and questioned our participants on how the technology might affect their queer lived experiences. We did this to elicit unique representations of their expression and desired wearables.

1.3 Contributions

We provide three main contributions through our research:

1. We offer a knowledge base regarding queer wearable design, specifically through a series of wearable design recommendations and considerations. By providing a thorough understanding of the lived experiences of the queer community, wearable designers will have the resources to improve existing practices for queer expressivity in wearables and create new, more meaningful experiences for queer users.
2. We provide a series of user-generated queer wearable designs to provide a direct insight into the types of wearables the queer community envisions and would benefit from. While coming from a utopian perspective, they may serve as inspiration for the direction of future queer wearables from a human-centred perspective [36].

3. We finally provide a methodological contribution in our execution of a body mapping user study examining queer wearables and identity expression. The methodology can be easily replicated to answer similar research questions for other populations and encourages future HCI work that veers away from the marginalization of underrepresented users [36,126].

1.4 Thesis Outline

This thesis is comprised of 6 chapters. The first chapter provides an overview of the study’s motivations, research questions, and contributions. The subsequent section provides a literary review of existing works on queer identity management and sexual and gender diversity in technology design. We, furthermore, explore works on wearable design regarding dimensions of aesthetics, wearability, social acceptability social wearables.

We present the two phases of the study in Chapters 3 and 4. In both chapters, we highlight each phase’s respective participant pools, data collection procedures, including details on our interview questions and body mapping workshop structures, and analysis techniques. In both chapters, we also present each phase’s specific results. In Chapter 5, we present collective themes derived from the entire research undertaking and offer discussions regarding queer expression, designing wearables for queer users, and body
mapping as a queer research activity. Lastly, in Chapter 6, we revisit the research questions and explore future works, limitations, and the conclusion of the thesis.
Chapter 2: Background and Related Work

In addressing our research goals of establishing a knowledge base for the improved design of wearables that support queer expression, we explored existing literature on four key domains. These fields include queer identity management and expression, HCI considerations for the queer community, wearable design pertaining to aesthetics and wearability, and social considerations for wearables mainly grounded in HCI literature.

2.1 Queer Identity Management and Expression

Queer expression is an incredibly diverse practice that has managed to preserve its roots and evolve over time. To better understand and offer recommendations regarding the implementation of queer expression in wearables, we analyze prominent examples of queer expression using bodies and semiotics while offering an insight into contemporary HCI research studying queer identity management.

2.1.1 Relating to the Bodies

Dress is one of the most prominent manners in which queer individuals express their queerness and can be both a large source of elation and stress when learning how to negotiate it [24,117]. We find early examples in the popularization of the “hankey code” in the late twentieth century. Using handkerchiefs placed in a back pocket, predominantly queer men would choose colour, pattern, and pocket location to discreetly communicate desires in intimate activities and roles [140]. In recent years, fashion and clothing have grown in popularity as a nonsexual queer expression [24,63,143]. In conducting interviews with 20 queer-identifying women, Reddy-Best et al. [116] highlighted queer dress as a volatile space in which queer women must negotiate between degrees of their displayed queerness. They found the explicit connection between gender
and the queer dress was noteworthy as participants used a balance of masculine and feminine dress, highlighting a reliance on gender performativity to communicate one’s overall queerness [115]. Clarke et al. [24] affirmed their findings with a more diverse participant pool, including gay and bisexual men and women, and found that queer dress often comes from a substantial need to highlight one’s queerness while also joining queer culture simultaneously.

We have additionally observed grooming as an incredibly vital tool for queer expression, one that often works in tandem with queer dress [116,117]. Much like clothing, Reddy-Best et al. [116] found that queer women often wore their hair in short-masculine hairstyles to represent their sexual identity.

Another popular means of queer expression lies in the practice of queer body modification (e.g., piercings, tattoos, corsetry) observed as offering the queer community yet another opportunity to subvert societal norms surrounding topics like gender and sexuality [14,81]. For instance, in interviewing six queer body modifiers, Pitts [111] highlights practices of queer modification done with the intention of explicit and “flagrant” queer expression that can bring a sense of pleasure. This amalgamation of literature alone demonstrates the historical importance and future capability of crafting queer expression as a practice utilizing the queer bodies.

### 2.1.2 Queer Semiotics

The use of different symbols and signs to represent the different lived experiences of the queer community has always been an extremely popular practice. Arguably one of the most prominent examples of queer semiotics lies in the use of pride flags. Pride flags represent any subset of the greater queer community and, as such, encompass dozens of
different colour and pattern combinations to represent different sexualities and genders [8]. Special-interest groups within the queer community have also used pride flags as expressive tools, such as the leather community (Figure 1).

![Pride Progress Flag (Left), Leather Pride Flag (Right)](image)

**Figure 1 - Pride Progress Flag (Left), Leather Pride Flag (Right)**

Iconography also plays a vital role in much of the queer community’s expression. One of the most prominent examples of queer semiotics is in the inverted pink triangle. Originally used as a way for Nazi Germany to flag gay prisoners, the symbol was reclaimed in the late twentieth century during the height of the gay liberation movement as a symbol of queer pride [69,112]. Similarly, the lambda has a lesser-known history as a queer symbol used during the height of the gay rights movements. Queer semiotics has also taken on the form of images such as the labrys and a double-sided axe that serves as a shared symbol for feminism and lesbian pride [102,146]. Queer individuals have also popularized gender symbols as ways to represent either one’s sexuality or gender, depending on the orientation and overlay of symbols. Figure 2 displays the aforementioned queer semiotics. Historical and modern applications of queer semiotics highlight the potential application of visual means representing queerness through a shared aesthetic.
With the growing popularity of online communities and SNSs, prominent user experience discussions for queer communities have begun to focus on the online queer persona [5,60,97,144]. One of the leading avenues for online identity expression comes in the form of SNS use, with a rise in research investigating how queer users utilize sites like Facebook and Tumblr to navigate their identity disclosure [110]. For instance, DeVito et al. [34] reported that queer SNS users often manage a “personal social media ecosystem,” leveraging privacy affordances for specific audiences. Carrasco et al. [22] echo their findings discussing the use of SNS as a means of queer expression as an ongoing balance between how users explicitly show their identity, their level of community engagement, and the visibility of their profiles. These both demonstrate how queer SNS users highly favour the practice of “selective visibility” when navigating the expression of their queerness online [39].
Beyond identity disclosure, research has also explored the use of SNS as an avenue for queer identity discovery [5,21,43]. For instance, Haimson et al. [56,58] examination of Tumblr transition bloggers brought to light an existing and extremely common practice of using Tumblr as a means of “transition work,” where engaging in activities like expressive writing allowed users to explore their gender identities. Much like Devito et al. and Carrasco et al. [22,34], Haimson et al. noted that transition bloggers would leverage the ability to keep different identities and networks separate for different stages of their gender transition.

While much of the research dedicated to queer expression through technology has focused on SNS usage patterns, new work has begun to explore different techniques for managing and engaging with queer identities. Queer game studies offer interesting perspectives on digital identity expression, particularly through the connection between queerness and the gameplay [119]. Both Kretzschmar et al. [85] and Salter et al. [122] provide case studies of specific dating simulators that, through an explicit resistance to heteronormative game design, promote a more meaningful and personal experience for queer gamers. Howard et al. [64] expands on these findings by highlighting the common practice of queer modifications to mainstream games lacking queer representation.

Regarding emerging technologies, Argüello et al. [4] explored the potential of wearables as an avenue for identity management through an examination of Apple Face ID technologies and facial prostheses. They found that by utilizing prostheses of facial features that were not their own, queer Apple Face ID users could create a variety of digital identities that better represent the fluidity of their own identity expression. Existing literature on queer identity management, while fruitful in online spheres,
highlights the needed expansion of work into physical emerging technologies for the
exploration and expression of one’s queerness.

2.2  HCI Considerations for the Queer Community

Queering the heteronormative standards of knowledge and design in HCI has been a
domain of growing importance in recent years [88]. In answering our research questions,
it is essential to gain a deeper understanding of the existing state of queer work in the
field of HCI and existing considerations for designing for queer users.

2.2.1  Queer HCI

HCI as a domain finds much of its roots in what DeFernandez [31] attributes to an almost
intrinsic desire for humans to explore and better understand the use of tools, starting with
our bodies and now with our newest tools in digital technologies. Reeves [118] and
Butler et al. [20] expand on this idea as a scientific domain, highlighting HCI as being a
study focused on the study and design of interactive technologies. Butler et al.
particularly emphasizes the multifaceted nature of HCI as a domain that brings together
fields like Computer Science, Engineering, and Psychology in a way that often
necessitates the application of all to discover new knowledge.

Queer HCI, however, is characterized by a multifaceted approach to challenging
heteronormative standards of acquiring and disseminating knowledge in HCI [33,130].
As implied by the name, a substantial portion of existing Queer HCI literature focuses on
research done by or for the queer community. Kannabiran [73–75] discusses this need for
queer perspectives in HCI works as a push against a two-tiered silencing of queerness
that simultaneously places heterosexuality as default while suggesting that sexuality does
not matter in HCI. Research in Queer HCI, however, argues that it is the explicit
inclusion of topics of sexuality, both as an identity and practice, that would inspire new perspectives in the critique of new and existing HCI research [18,33,35,130].

Queer HCI is also comprised of efforts that are not explicitly focused on queer lived experiences, but also the queering, or subversion, of heteronormative research [88,126]. For instance, Linxen et al. [90] found that despite only making up approximately 12 percent of the world’s population, 73 percent of CHI study participants were from a WEIRD country (i.e., Western, Educated, Industrialized, Rich, and Democratic). They argue for a push to both recruit and collaborate with researchers on a more diverse, international scale. In a like manner, Liang et al. [87] explored the ways HCI researchers navigate work done with marginalized communities. Rather than hiding away from complex and often uncomfortable conversations surrounding marginalized communities, they encourage this difficult research and provide recommendations for balancing complexities along the lines of exploitation, membership, disclosure, and allyship.

Dombrowski et al. [36] discuss similar tensions through the lens of design by introducing their Social Justice-Oriented Interaction Design framework. By employing one of six design strategies (e.g., recognition, reciprocity, accountability), they argue that designers can more smoothly navigate the complexities of political and ethical responsibilities that arise in social justice design. As a prototype, Flemings et al. [42]’s Crimson Wave serves as a practical example of Queer HCI thought in application. While menstruation technologies have risen in prominence in HCI, Flemings et al. make a clear distinction with their device created with the intention of stimulating “discussion about the stigma surrounding menstruating bodies,” highlighting deviation from established
embodiment practices conceptualizing a singular, ideal body and menstruation being a bodily function reserved solely for those who identify as women [129,137,147]. Our work thus seeks to make use of Queer HCI practices in not only highlighting queer users’ needs, led by a queer researcher, but also questioning contemporary HCI understandings of the design of wearables.

2.2.2 Designing for Queerness

Work exploring design considerations for the queer community have risen in prominence as of late [8,36,126,134]. Popular conversations on accounting for gender diversity in design have focused on mobile and website design. Tang [132] argues for a fallacy in popularized ideas about “genderless design” in graphic design [124], stating that genderless design only perpetuates binary norms by suggesting societally masculine design (e.g., neutral, bold, minimal colour) is the norm. They encourage designers to take on a “gender fuckery” approach through the subversion of gender norms in design via the experimentation of societally ascribed gendered design elements (e.g., lighter colours for a “masculine” product like a grill). A substantial amount of gender-diverse design work has also focused on designing with gender diversity in mind, particularly through the exploration of what Haimson et al. define as “trans technologies” as those intended to support different aspects (e.g., multiplicity, ambiguity) and periods of gender transition [4,58,59].

A recurring design recommendation arises in discussion on user agency. Bennett et al. [11] found that transgender and non-binary screen readers, while initially excited, were hesitant when considering the potential of AI-generated image descriptions and should instead better support the self-authoring of images. In examining the topic of
“Queer UX,” Beare et al. [10] similarly encouraged a “centring of queerness” by encouraging the designers of mHealth services to allow users to choose not only their displayed gender identity and pronouns, but also when this information would be disclosed.

Acknowledging multiple identities and experiences has also been an extremely important recommendation when designing for gender diversity [17]. For instance, in discussing a growing HCI trend of omitting non-binary participants for being statistically negligible, Jaroszewski et al. [67] explore gender diversity in surveys for online communities. Through their findings, they present a series of survey design recommendations, including phrasing and contextually informed questionnaire language, to gain survey responses that are meaningful for non-cisgender participants. Augustaitis et al. [6] reported similar design implications for gender diversity, however, in the case of information dissemination via transgender health information platform design. They emphasized the importance of avoiding a “singular narrative” and instead design platforms to share health information, risks, and personal experiences for all non-cisgender individuals and those of different marginalized groups such as racial minorities and disabled communities.

Literature on the presence, and subsequent mitigation, of data collection and privacy concerns the queer community have also risen in prominence. Through examples such as anti-sodomy laws dating back to the 17th century and the “Lavender Scare” of the 1950’s, the queer community has a long-standing history of privacy invasions and security risks [155]. As they are found to be early adopters of online technologies, often for the purpose of seeking quality-of-life resources unavailable to them [55], the National
Cybersecurity Alliance describes the data privacy as having “life-saving significance” for the queer community as they risk social stigma and discrimination as a result of poor data security practices like malicious data dissemination, tracking, and algorithms [1,127]. Jaroszewski et al. [67] and Loewy [92] both highlight recurring trends both in HCI and government survey data collection that frequently omit queer lived experiences, arguing for more nuanced data collection as it would lend to the notion of creating design decisions that benefit non-queer communities as well [1]. Particular methods of designing to for queer data security have, much like most queer identity management literature, largely focused on the online SNS context. DeVito et al. [34] particularly highlights the importance of the context of use as different perceptions of privacy affordances for varying social medias will change how a queer user presents themselves.

2.3 Wearable Design: The Role of Aesthetics and Wearability

Wearables offer a unique opportunity to explore user embodiment through physical technology [105]. Given the nature of our research questions, it is thus essential to explore wearable design, particularly as it relates to aesthetic considerations and wearability as well as the social implications.

2.3.1 Aesthetics

Amongst design qualities like functionality and security, aesthetics remain one of the key design traits that can heavily influence the adoption of a wearable [68]. For instance, Muller et al. [103] observed that fitness wearables with superior design aesthetics and brand names were likelier to attract and retain usage amongst young adults. In a similar vein, there has been substantial work to suggest that poor aesthetics can act as a barrier to wearable use, with Juhlin et al. [72] and Pateman et al. [109] arguing that wearable
design that ignores fashionable and well-crafted aesthetics poses the risk of causing disinterest [37,38,108].

In discussing the barriers and restrictions surrounding wearable aesthetics, a recurring solution in wearable research is observed in designing for customizability. The customization of wearables has been observed for potential in offering users the opportunity to create personalized aesthetic experiences [68,72,109]. Harrison et al. [62] argue that personalized aesthetics through customization thus encourage consistent wearable adoption amongst users. Customizable aesthetics has also been observed as particularly useful in wearables designed for marginalized communities, such as disabled communities [145]. In exploring the customization of cochlear implant aesthetics, Profita et al. [114] suggests that customizability of aesthetics components served to help establish more meaningful connections between users and their assistive devices.

Against this background in wearable aesthetics and customizability, we seek to investigate the importance and application of both qualities on queer wearables. In particular we believe there is further work needed to explore the application of queer aesthetics through wearables in a similar manner to aesthetic considerations for assistive technologies.

2.3.2 Wearability

While wearable research has dedicated much interest to creating novel technologies [44,95,96,139,153], a crucial area of this work has been set out to examine wearability as a design considerations for wearables [91,101,105].

Gemperle et al. [47] produced one of the first, and most influential, investigations into device wearability, which they define to be “the physical shape of wearables and
their active relationship with the human form.” They introduce 13 design guidelines for wearability, highlighting design implications from less complex qualities such as physical placement and proxemics to more nuanced, context-specific considerations like passive versus active input and long-term effects on the user’s body and mind. Following preliminary insights from a user study on dynamic wearables, they argue that adhering to these design guidelines for wearability allow the creation of wearables that are comfortable and appropriate for the user. Zeagler [152] revisited Gemperle et al.’s guidelines 19 years later to explore their validity amongst changing technology and use cases. Overall, Zeagler corroborates much of Gemperle et al.’s initial findings while adding more specific details using case studies. For instance, when considering the weight of wearables, they agree that designers should apply weight and load to the user’s waist whenever possible, particularly on the lower waist and on the fleshy parts of the body. Zeagler does introduce a variety of new design considerations for wearability based on recent literature such as how garments are created, body locations for different biometric sensing, and body placement for movement sensing.

2.4 Social Considerations for Wearable Design

2.4.1 Social Acceptability

Given the rise of commercial failures of wearables like the Google Glass [80,154], there has been an increase in works investigating the social acceptability of wearables [83,113]. Kelly et al. [78] defined a socially acceptable wearable as “marked by an absence of negative reactions or judgments from others.” [83,113].

Design implications for the social acceptability of wearables tend to focus on conversations surrounding bodily locations and gestural interactions [152]. Per Dunne et
al. [123], these two qualities can often worsen the negative impact a wearable has on a social interaction. Negative impact is minimized should designers place wearables on common and non-distracting areas like the wrist or forearm while, context depending, avoiding locations typically associated to sexual activity or bodily waste [123,152]. Dunne et al. [37] also suggest that interaction design should take into account societally accepted gestures, such as incorporating commonly used pinching and swiping motions over less popular shaking motions.

Social acceptability considerations have also extended toward what Buenaflor et al. [19] describe as the “social aspect” of wearable design. They add that a user’s personal privacy, the influence of those in their social circles, and different cultural factors will influence a wearable’s adoption. Kelly et al. [76–79] developed the Wearable Acceptability range, or WEAR Scale, to aid in asserting the level of social acceptability of a wearable. They introduce 14 Likert scale questions that centred on two factors of the device either fulfilling a user’s aspirational goals or meeting their fears. Upon calculating the mean of participant responses, a score out of 6 would be obtained, with an increasing number indicating increased social acceptability. This has proven useful as wearable designers could easily apply it to different contexts. For instance, while Kelly et al. [76] argued that aesthetics are ultimately not a main motivating factor in wearable social acceptability, Nam et al. [104] extended the wear scale for the context of smart apparel to highlight more aesthetic and functional attributes. They refined the WEAR scale to a 15-item questionnaire that now focused on the four factors of design and aesthetics, self-expression, consequence, and reflection by others. While the literature investigating the social acceptability of wearables is thorough in its examination of different social and
bodily considerations, there is a lack of investigation into social acceptability for non-
privileged bodies and those of societally marginalized communities which we seek to
address.

2.4.2 Social Wearables

Wearable research and development tends to be concerned with personal metric
collection and tracking, largely ignoring the possibilities for the support of social
interaction amongst users [29]. Work has been dedicated, however, to exploring the
design of social wearables, wearable devices designed to support co-located social
interaction between users and their environment [40].

There exist several prominent studies on the design of social wearables. In their
framework, Dagan et al. [29] provide a series of design guiding questions for social
wearable designs to consider sensing (i.e., input), actuating (i.e., output), the sensing-
actuating relationships, personal and social requirements in the interactions, and the
device’s social acceptability. Their approach is particularly noteworthy as they suggest it
addresses the two “areas of values” for social wearables. They argue that the computation
of social wearables can add both social signalling of the user and unique proactive
interaction in different social interactions. Epp et al. [40] utilized this framework as
inspiration in their exploration of the relationship between social wearables and cultural
and identity practises through ethnographic and co-design workshops with Finnish
university students. They suggest future social wearables with self-expressive
functionality consider themes of using multifaceted components to stand out. This would
allow devices to dynamically display the user’s connection to different groups supporting
togetherness. Dagan et al. [28] further explored the potential of social wearable design by
introducing Synergistic Social Technology (SST). They introduce SST as a strong concept that refers to technologies with animistic “needs” that must be met through user interaction. They discuss these technologies, such as the *Robo-Shoe Flies* [27], having multiple users interacting in a beneficial way to adhere to the devices’ needs, therefore resulting in a synergistic relationship between devices and users. SST is meaningful when considering the design of social wearables as it further highlights the potential for social wearables to be easily moulded to specific contexts with various interaction techniques.

Additionally, several works are exploring the feasibility of different social wearable prototypes. Segura et al. [95] employed a practice of research-through-design co-design with a Live Action Role-Play (LARP) designer and organization team to create two unique LARPing prototypes to communicate different gameplay statistics and styles. Through designing for facilitating verbal and non-verbal communication, spectatorship, and physical and emotional connections, their prototypes supported gameplay socialization and external psychological benefits such as reducing cognitive load and heightened expression. Similar to Dagan et al. [28], Genç et al. [48] demonstrated the creative applications of social wearable design through their *DecoLive Jacket*, a smart jacket designed to dynamically help users signal their social availability through the display of a binary state, represented by an open or closed flower. Their social wearable is particularly interesting as it strays from typical screen-reliant battery-operated wearables and opts for an electrochromic display powered by NFC tags that read signals from a phone placed in certain pockets.

Investigations into both social acceptability and social wearables alike highlight the potential for wearables to affect and enhance social interaction. A more solid
foundation of the social implications of queer expressive wearables, however, requires a
greater understanding of the general experiences of queer end users and those with non-
privileged bodies.

2.5 Summary of Background and Related Work

In this chapter, we explored existing research to be able to answer our research questions
better. Our exploration of work on queer identity management and queer HCI design
highlights the intricate needs of designing for diversity and agency for queer expression.
We additionally explored the importance of wearables as an aesthetic technology and the
social implications of these technologies for both social acceptability and the ability to
influence social interaction. In the next chapter, we present our first phase of the overall
study, in which we carry out a series of semi-structured interviews with the queer
community. We carried out the first phase to gain a deeper understanding of queer
expressive practices, wearable usage amongst the queer community, and the potential of
wearables for queer expression.
Chapter 3: Study 1: Interviews

In Chapter 3, we address R1 (How does the queer community practice the expression of their queerness) and R2 (How can wearables be designed to best support queer expression). We carried out the first phase of our overall project by conducting a series of sixteen semi-structured interviews with a diverse representation of the queer community. We begin this section by highlighting the methodology we carried out, including our participant pool, data collection, and data analysis techniques. Secondly, we share our discovered findings from the first phase. We discuss how the queer community understands and views wearables, queerness, and queer expression and then present findings into the design of wearables, expressivity, and the intersection of the two as discussed by our participants.

3.1 Methodology

3.1.1 Participants

We recruited sixteen participants via different SNS platforms (Slack, Instagram, Facebook), networks within the queer community or snowball sampling techniques. All participants were English-speaking adults over the age of 18 who identified as a member of the 2SLGBTQIA+ community or any other identities that fall outside of cisgender and heterosexual. Table 1 displays a summary of our participants’ demographics. It is important to note that all demographic information provided is as stated by the corresponding participant and not assigned arbitrary categories by the researchers (e.g., PI06 identified their trans* history as “Unsure”). Participant pseudonyms for those who participated in the interview phase of the project follow the format “PI#.” We
compensated participants for their time with a CAD 20 electronic gift card to the online retailer of their choice. CUREB-B approved this study (Clearance #116259).

Table 1 – Study 1 Participant Demographics

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Gender</th>
<th>Trans* (History)</th>
<th>Sexuality</th>
<th>Race/Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI01</td>
<td>23</td>
<td>Man</td>
<td>No</td>
<td>Gay</td>
<td>White</td>
</tr>
<tr>
<td>PI02</td>
<td>34</td>
<td>Non-Binary</td>
<td>Yes</td>
<td>Queer</td>
<td>White</td>
</tr>
<tr>
<td>PI03</td>
<td>36</td>
<td>Agender</td>
<td>No</td>
<td>Gay, Queer</td>
<td>White</td>
</tr>
<tr>
<td>PI04</td>
<td>37</td>
<td>Non-Binary,</td>
<td>No</td>
<td>Pansexual</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Genderqueer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PI05</td>
<td>57</td>
<td>Man</td>
<td>No</td>
<td>Gay, Queer</td>
<td>White</td>
</tr>
<tr>
<td>PI06</td>
<td>26</td>
<td>Non-Binary</td>
<td>Unsure</td>
<td>Lesbian</td>
<td>White</td>
</tr>
<tr>
<td>PI07</td>
<td>20</td>
<td>Man</td>
<td>No</td>
<td>Gay</td>
<td>White</td>
</tr>
<tr>
<td>PI08</td>
<td>24</td>
<td>Woman</td>
<td>No</td>
<td>Bisexual</td>
<td>White</td>
</tr>
<tr>
<td>PI09</td>
<td>24</td>
<td>Trans-masculine,</td>
<td>Yes</td>
<td>Bisexual</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-Binary,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fluid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PI10</td>
<td>18</td>
<td>Woman</td>
<td>No</td>
<td>No label</td>
<td>White/Peruvian</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(non-male</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>identities)</td>
<td></td>
</tr>
<tr>
<td>PI11</td>
<td>31</td>
<td>Woman</td>
<td>No</td>
<td>Lesbian</td>
<td>East Asian/Indian</td>
</tr>
<tr>
<td>PI12</td>
<td>18</td>
<td>Woman</td>
<td>No</td>
<td>Bisexual</td>
<td>White</td>
</tr>
<tr>
<td>Participant</td>
<td>Age</td>
<td>Gender</td>
<td>Trans* (History)</td>
<td>Sexuality</td>
<td>Race/Ethnicity</td>
</tr>
<tr>
<td>-------------</td>
<td>-----</td>
<td>-------------------------</td>
<td>------------------</td>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>PI13</td>
<td>23</td>
<td>Genderqueer</td>
<td>Yes/No</td>
<td>Bisexual</td>
<td>White</td>
</tr>
<tr>
<td>PI14</td>
<td>31</td>
<td>Non-Binary</td>
<td>Unsure</td>
<td>Queer</td>
<td>White</td>
</tr>
<tr>
<td>PI15</td>
<td>23</td>
<td>Woman</td>
<td>No</td>
<td>Gay</td>
<td>White</td>
</tr>
<tr>
<td>PI16</td>
<td>21</td>
<td>Something like ‘woman’</td>
<td>No</td>
<td>Lesbian</td>
<td>White/ Filipino</td>
</tr>
</tbody>
</table>

### 3.1.2 Data Collection

We collected data via semi-structured interviews with each of the participants. All but one participant opted for *Zoom*, with the other participant using *Google Meet*. We recorded all interviews, and they lasted, on average, 49 minutes (shortest = 27m 46s, longest = 74m 30s).

We will now discuss the interview structure, providing rationale for methodological decisions made. Readers can find the full interview guide in Appendix B. Figure 3 visually displays the overall structure and steps of the first phase of the study.
Demographics. We began our interviews by gathering our participant’s demographic information. Along with providing a better understanding of our participant makeup, we used demographic information to ensure our participant pool reflected a diverse set of the queer community.

Identities Expression. Through discussion on the expression of their identities, we explored participants’ experiences with the expression of queer identities in their daily life. We carried out this series of questions to gain a deeper understanding of our
participants’ queer expression practices, barriers they may face, and how they perceive and understand the queerness of others.

**Wearable Usage.** The following questions we asked focused on participant experiences, opinions, and understandings of wearables. We formulated these questions to help gauge the queer community’s mental model of wearables. We did this by exploring our participants’ familiarity with wearables, wearable design qualities they deemed beneficial or necessary, and barriers that might inhibit their use of wearables.

**Technology and Queer Expression.** Our final series of discussions investigated identity expression as it relates to wearables and explored participants’ attitudes and opinions regarding using wearables to express their queer identities. Due to the abundance of evidence suggesting the importance of digital expression through tools like SNS, we asked participants to reflect on their current use of different technologies for identity expression. We concluded our interviews by presenting our participants with a fictitious design scenario to determine design considerations and encourage design ideation for a queer expressive wearable.

### 3.1.3 Data Analysis

We transcribed all interview recordings using the transcription software *Trint* [135]. All participants consented to using *Trint* to help accelerate the transcription process. The lead researcher reviewed all automatic transcriptions for accuracy and familiarization before analysis. During the process of data familiarization, the lead researcher exported each transcript to individual Microsoft Excel sheets, breaking each transcript down further into
relevant quotes coded under relevant themes. Upon final coding, the lead researcher combined all meaning segments in one sheet to aid with data retrieval, comparison, and filtering.

The lead researcher conducted a process of thematic analysis on the interview transcripts following the established guidelines by Braun and Clark [15,16] and David R. Thomas [133]. To determine the necessity of further recruitment should findings vary greatly, we conducted an initial thematic analysis on three transcripts from diverse participants. The lead researcher created summarized descriptive coding for each meaning segment followed by a more condensed latent coding and then provided final codes for the three transcripts and established an initial code frame. The recurrence of several common codes indicated no need for further recruitment and data analysis. To verify the coding process, the lead researcher and another member of the research team repeated the process with a fourth transcript to collaboratively review and redefine the code frame. The lead researcher then repeated the same process independently for the rest of the transcripts, at each stage reviewing and redefining the code frame until further changes were not necessary.

Finally, using the online whiteboarding tool Miro [156], we visually organized codes into larger themes according to the degree to which they were central organizing concepts that encapsulated different aspects of our participants’ queer expression and wearable experiences. The thematic organization of codes lent itself to the further creation of thematic relationships between themes when discussing the connection between the framing and design of both wearables and queer expression.
3.2 Findings

In response to our research questions, we found three themes: wearable use and design, queerness and expression, and wearables and expression. We break down each theme into subcategories such as framing queerness, designing for expression, and designing wearables. Figure 4 demonstrates the overall thematic relationship of the study results, while Figure 5 and Figure 6 display the thematic relationship between subcategories of wearable use and design and queerness and expression. For participant quotes, we removed filler words to enhance readability.

![Figure 4 – Thematic Relationship of Interview Findings](image)

3.2.1 Wearable Use and Design

We provide an initial framing of wearables for the queer community through discussion, including what they understand wearables to be, device usage patterns, and secondary themes surrounding wearables such as accessibility and social acceptability. We also share insights on the design of wearables from a queer perspective, including conversations on barriers, desirable features, and the benefits of wearables for the queer community.
3.2.1.1 Framing Wearables

3.2.1.1.1 Wearable Familiarity

Participants shared the wearable styles they know of and those they have personal usage experience with. Participants highlighted their knowledge of 12 different styles of wearables, as shown in Table 2.

Despite smartwatches being the most well-known style of device, it was also the only style that participants mentioned explicitly not desiring (n=3), with PI08 and PI10 both sharing that they avoid smartwatches as most functionality is already offered by mobile phones they are more comfortable with. The highest reported style of wearable used by our participants is fitness wearables (n=7), which participants often described as
being more distinct than standard smartwatches, with PI15 saying: “Mainly it’s a fitness tracker that happens to have all these other nice features.” Earbuds and headphones were the second most common style of wearable used (n=6). While five participants discussed them for entertainment purposes, PI06 expanded that these devices are important as an accessibility tool: “because I have ADHD, a big issue is stimulant regulation. It’s very hard for my brain to get enough stimulation or cope with too much stimulation and headphones are a very important piece of wearable tech.”

Several participants also discussed analog wearable usage. While three participants shared their use of devices like glasses to be an example of wearable use, PI09 highlighted the use of both drag materials (“coloured contact and corsets to cinch the waist”) and gender affirming wearables (“I used to use binders for my chest so that would count, and I used to consider packing and the use of bottom prosthetics.”).
<table>
<thead>
<tr>
<th>Wearable Style</th>
<th>Frequency</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smartwatches</td>
<td>12</td>
<td>“I would instantly think an Apple Watch” (PI11)</td>
</tr>
<tr>
<td>Digital Glasses</td>
<td>7</td>
<td>“Google Glass” (PI15)</td>
</tr>
<tr>
<td>Fitness Wearables</td>
<td>7</td>
<td>“Garmin running watch kind of springs to mind.”</td>
</tr>
<tr>
<td>Health Wearables</td>
<td>7</td>
<td>“ECG/EKG or Heart Rate monitors” (PI01)</td>
</tr>
<tr>
<td>Earbuds/Headphones</td>
<td>6</td>
<td>“Bluetooth headphones” (PI06)</td>
</tr>
<tr>
<td>Analog Wearables</td>
<td>4</td>
<td>“A wind-up watch is a wearable” (PI04)</td>
</tr>
<tr>
<td>Accessibility</td>
<td>3</td>
<td>“Hearing aids” (PI16)</td>
</tr>
<tr>
<td>Heads-up Displays</td>
<td>2</td>
<td>“Oculus or any Virtual Reality headsets” (PI01)</td>
</tr>
<tr>
<td>Body Modifications</td>
<td>2</td>
<td>“3D implants, like people get like horns in their foreheads” (PI09)</td>
</tr>
<tr>
<td>Mobile Phones</td>
<td>2</td>
<td>“A phone, which is also wearable tech” (PI06)</td>
</tr>
<tr>
<td>Prosthetics</td>
<td>2</td>
<td>“Prosthetics might also apply… it is technology that you wear also” (PI10)</td>
</tr>
<tr>
<td>Person Tracking Wearables</td>
<td>1</td>
<td>“Ankle bracelets for monitoring purposes” (PI05)</td>
</tr>
</tbody>
</table>
3.2.1.2 Social Implications of Wearables

Following our interviews with participants, we observed the recurrence of participants’ conceptualizations of the social implications of wearables on social acceptability and interaction.

Our participants discussed wearables, particularly smart watches with notification management features, as beneficial because of their social acceptability. We found this particularly noticeable for participants when they compared it to less socially acceptable actions like looking at a phone in public settings. PI03 and PI04 both shared it was beneficial for not being rude to those around them: “Just like socially, [checking notifications on a smart watch] was really helpful because I realized pulling my phone out towards the end of a meeting would make the person in charge think I was in a hurry, and they would then change their behaviours. So, it’s nice to be able to check things on my way discreetly” (PI04). PI08, on the other hand, stated that an environment where everyone used a particular wearable could cause undue social pressure: “A lot of my friends have Apple Watches, and they use them at work instead of their phones. So, I guess it’s a bit of a social pressure [to also use one].”

Three participants also shared that expression through wearables affords a heightened sense of social connection. PI14 discussed the idea that technology is commonly used to establish communities, using the hankie code as a historical example: “I feel like a lot of folks are already using technology to find community... I was thinking about hanky codes earlier in terms of what people use to communicate desires or preferences, and I thought hankies are kind of a wearable than when you think about it.” PI05 shared an experience in which their Pride smart watch backgrounds facilitated
interaction with a concert employee: “We were going to a concert one evening and I just happened to have on one of the Pride faces. The ticket taker said ‘Oh, what a cool watch face’ and we talked more about the different faces. It was interesting that someone called it out. People are paying attention to how folks are using wearables, particularly to express queer identity.”

3.2.1.2 Designing Wearables

We found several benefits of wearable use as shared by our participants. Shared benefits include convenience and improved mental health through fitness monitoring. Five participants highlighted the convenience of wearable devices like smart watches, with PI02 stating the benefit of external device connectivity. Three participants extended this in that wearable earbuds and headphone devices provide the advantage of sensory regulation and overstimulation management. In addition to earlier discussions of sensory regulation, PI03 and PI04 both shared that the fitness monitoring functionality of their wearables is beneficial to their mental health: “When I can’t exercise, my mental health is not in a great spot so it’s quite an important tool for managing my mental health” (PI03).

3.2.1.2.1 Wearable Technology Barriers

Participants emphasized a multitude of barriers that limit access to wearables. Two noteworthy barriers included high costs and technological literacy. Shared by nine participants, we found cost to be the most common barrier to wearable access. PI03 shared that being able to afford wearables would block many within the community: “I now work in tech, so a well-paying job. That’s definitely not going to be available to a huge portion of the [queer] population so I do think cost is a big factor.” Four participants
also shared expectations surrounding technological literacy arise when trying to use wearables. PI03 characterized this knowledge with a reliance on technological language: “There’s a lot of jargon and it’s hard to pick out what’s going to be useful, what’s going to be interesting because a lot of these technologies are so new. It’s like ‘Do I really need that? Will it be a distraction?’”

We also found critical barriers surrounding both physical and data safety. For three participants, there were explicit health concerns when using wearable devices. PI14 defined this ability to facilitate self-destructive behaviours, particularly with eating disorders, because of fitness wearables pursuit for a sense of self-optimization: “I feel like a lot of these wearables, especially when it comes to fitness, are going to push you to do even more steps and more things you always have got to keep optimizing. And I don’t agree with that, I don’t think that’s good.” In a like manner, three participants also discussed data safety as being a barrier to wearable use. PI07 shared a fear of not knowing what is being done with their data as a barrier to wearable use: “We’re plugged into this whole extreme biometric system where every movement and conversation is measured and tracked and catalogued and that creeps me out.”

3.2.1.2.2 Desired Wearable Qualities and Features

Our participants discussed 18 qualities they attributed to the definition of “worthwhile” wearables. We break down design qualities mentioned by at least two participants (14 comments) into five sub-categories of safety, usability, accessibility, hardware, lifestyle considerations.
Safety. Five participants emphasized the importance for expressive queer wearables designed with safety in mind. With PI02 recalling fears of applications like Grindr used to target queer users [66], PI14 stated that “very granular safety [is important]” particularly important when creating devices to communicate queerness in a collocated manner: “it would need to be tight-knit. It may be local only, like only if you’re in the physical vicinity and only ten people are standing around, for example.”

Four participants stressed the significance of “data privacy and protection” (PI04). PI02 questioned the nature of collection for their specifically queer data: “So you’re asking me for my gender identity and my pronouns and you’re turning around and selling that to Facebook…that is so incredibly stressful to me.” PI11 also expressed this importance on data protection and privacy as stemming from the nature of most wearables being in a state of constant, uninterrupted use: “Once it’s wearable, it’s always with you. The behind-the-back data collection I’m not happy with and I’m waiting for wearables to gain more privacy before I’ll start using them.”

Usability. Six participants emphasized that wearables discussed the relationship between useful functionalities and queer expressivity. Both PI04 and PI07 alike stressed that the queer expressivity of a wearable device should be designed as a layer on top of core functionality. PI07 described the relationship: “I think it would be something that is functional enough that does everything that I needed it to do but then having that sort of outer appearance of 2SLGBTQIA pride.”

Building off the idea of functionalities, six participants highlighted the importance of ease of use (PI01) and intuitive design (PI06). PI14 described this usability as
wearables that offer, “an interaction with technology that really works with you, where you are not forced to read a manual, but have something that meets the user where they are.” PI03 exemplified this through the WHOOP fitness device having a perceived overabundance of metrics, causing stress as a result of having to balance their life around the device. Participants did highlight specific functionalities or applications they deemed as beneficial, with the most popular being notification (n=6) and health (n=4) management.

Accessibility. Eight participants highlighted an importance for designers to create wearables that take into consideration different disabilities and lived experiences with PI08 stating that “accessibility has to be one of the top priorities” for a new wearable. PI04 said: “One thing is [the ideal wearable] just be designed for accessibility and inclusivity, especially around people who have a disability or have other ways of accessing technology.” Additionally, two participants discussed the importance of wearables being easy to use and access. While PI01 defined this wearability simply as something “easily portable,” PI06 described their perfect set of sensory headphones as “small enough that if I go to sleep, they don’t hurt my ears when I’m lying down.”

Hardware. When discussing the hardware of wearables, we found pleasant aesthetics to be important for six of our participants. PI15 discussed their disappointment with fitness smartwatches being too rugged: “Sometimes I wish it was less sporty. I wish I could have another watch and if I’m going to something nice, like a wedding, I could wear it. I wouldn’t wear my neoprene watch.” PI12 said poor aesthetics would triumph over useful
functionalities: “even if it had all the features and I didn’t feel like it looked good, I still wouldn’t use it.”

We found four participants appreciated the customizability of components with their wearables. PI05 discussed this as affording a certain sense of adaptability: “I would want [a wearable] to be adaptable and not without the value. That adaptability would make it more amenable for me.” PI04 and PI13 both discussed customizability as allowing them a greater sense of creative ownership over their wearable by allowing them, “to be able to design the whole [device]”(PI04).

Finally, three participants highlighted the importance of high-quality materials. PI06 shared concerns with what they suspect to be a growing practice of planned obsolescence: “I think quality goes with the aging out of our tech that is purposely made obsolete.” PI08 echoed this consideration: “[Earbuds] obviously have to be good quality because I’m expecting these things to last me a couple of years and not just break down after a couple of months.”

_Lifestyle Considerations._ We found several discussions on the importance of wearables being “useful for your everyday life” (PI01). We observed descriptions of the ideal wearable as “a twenty-four-hour piece of tech.” (PI06) that “should add to your specific quality-of-life” (PI01). Three participants also added that it was important for wearables not to be distracting to the wearer and remain compatible with external devices. PI02 equated this with issues when looking to one’s phone for time: “The concern being, well how many times do you at your phone for the time and then you have no idea what you just saw because you got distracted by a text and you have to look again.”
3.2.2 Queerness and Expression

Participants identified a complex relationship of different factors that provide a deeper understanding of queerness and expression. Using our participants' insights, we offer an initial framing of important factors of queerness and expression, respectively. We simultaneously provide conversations on designing for expressivity via discussions on barriers to expression, practical considerations for expression, and current expressive practices amongst the queer community.

Figure 6 – Thematic Relationship between Themes for Queerness and Expression

3.2.2.1 Framing Queerness

Community. Every participant explicitly discussed queer community connectivity and the blending of marginalized communities as it relates to queer lived experiences. PI13 emphasized this idea of togetherness when sharing why they express their queerness:

“You notice each other, and it automatically feels like a connection with other people in
Participants also highlighted important intersections and relationships with other marginalized communities, such as disabled and racialized communities. Four participants highlighted a meaningful connection between the queer and disabled communities, with PI06 stating that “to be disabled is a bit queer in the same way that queerness used to be understood as a disability.”

**Understanding Queer Identities.** Eight participants explained their process of queer identity formation as something that consistently evolves. While some participants were able to share specific pivotal moments in the evolution of their identity (n=2), participants discussed this evolution as an ongoing process of “constantly examining our own identity. It might be different a year from now, a month from, a day from now” (PI15). An important fact shared by participants was that, despite the evolution of identities, past identities are not necessarily considered obsolete. PI06 expressed this sentiment when discussing their journey from identifying as bisexual to a lesbian: “at that time I was bisexual, and I’ll still refer to myself in the past as being bisexual then and bi experiences are still very relatable and important to me. It’s just that now I’m a lesbian because I am no longer attracted to men.”

Awareness of queer identities also proved to play a large role in the formation of one’s own queerness. Three participants indicated an evolution in their own queer identity upon discovery of other identities. PI03 stated: “over the last three or four years, I’ve kind of realized that non-binary agender exists. It wasn’t necessarily an identity I was aware of and, once I became aware of it, it was like ‘oh yeah, I totally get that.’”

**3.2.2.2 Framing Expression**
While several participants highlighted a basic desire to avoid misidentification (n=6), six participants shared that their expression is a means to heighten queer visibility. PI13 described it as a societal goal to “increase the visibility for people who are maybe not as used to [queerness].” Similarly, five participants shared queer expression as a means of displaying a feeling of queer pride, with PI01 and PI04 doing so to “express who I am and not withhold those aspects of myself from the world” (PI04). We also found signalling to be a common motivator for queer expression, both in communicating queerness (n=5) and establishing safe spaces (n=2).

For nine participants, queer expression is not to be conflated with their queer identities. PI04 highlighted that it is important to actively practise “not thinking about a person’s identity based on their expression” because “there’s a lot of assumptions that go in between connecting how someone expresses themselves to how they identify.” PI06 provided an example when reflecting on their non-binary identity: “I am non-binary, but there are a lot of aspects of womanhood and femininity that are important to me.” In fact, several participants shared that queer expression extends beyond signalling non-cisgender and heterosexual lived experiences (n=6) and was an important way to demonstrate one’s values, life experiences, and “perspectives of who [they] are” as people (PI13). PI15 exemplified this through their use of stickers to express themselves saying: “It gives a nice encapsulation of me and the things that I like and care about, not just my queer identity.”

In a like manner to queer identity, participants discussed how their queer expression is constantly evolving over time (n=13). This is often experienced as a “flux” (PI02) in which different methods of expression feel more or less meaningful over time.
For PI01, this evolution resulted from feeling more emboldened to express themselves openly: “I have gotten used to wearing [expressive] items over time. When I first came out, I didn’t wear any identifying items.” PI08 and PI09, on the other hand, shared “settling into a semi-cognizant identity” (PI09) resulted in them not feeling the need to practise as intense gender expression.

3.2.2.2.1 Factors Impacting Expression

Participants shared different factors including environmental, social, and cultural factors that might influence how they practise their queer expression. We found a queer individual’s environment to be the most common factor amongst participants that played a role in deciding how to express oneself (n=13). Seven participants shared that more urban and progressive locations like metropolitan cities and universities often allowed them to feel more comfortable expressing their queerness openly.

Participants also shared that social and cultural contexts were important to consider when deciding how to express themselves. PI06, for instance, shared that “[queer expression is] very context specific for me. [It is different] at home versus at work, or with my pals versus my family.” Seven participants highlighted a hyperawareness of the perception of those around them to be a substantial influence on their expression. This often resulted in the editing of their expression, such as PI14 code-switching language, to satisfy others or avoid conflict. Despite this, nine participants shared that the presence of those around them can be a positive factor in their expression particularly in the queer expression of others serving as encouragement of their own expression (n=9). PI06 described this sensation as “a continuum of queer joy.” Six participants also discussed the impact culture has on queer expression. PI11 exemplified
this when discussing the differences in queer expression between India and Canada: “it’s almost a western concept where you outwardly put-up flags or pin something people can see. That’s something I never caught on to because of my culture and identity.”

3.2.2.2 Outcomes of Queer Expression

Participants shared numerous outcomes of queer expression, both meaningful and inauthentic (n=12). Participants discussed meaningful outcomes as comfort, euphoria, pride, confidence, and a sense of validation in one’s identities. We found inauthentic expression to result in dysphoria, dissociation, and misidentification from others.

We found meaningful queer expression was connected to a sense of comfort (n=5) or euphoria (n=4) with PI11 explaining that they “feel like [they are] in [their] own skin.” Similarly, PI10 explained that “when I go out and dress like, very gay, I enjoy it and I enjoy that expression.” Four participants emphasized that queer expression brought a sense of queer pride through an “assertion of queerness” (PI06) and feeling “validated” and "visible” (PI13). Queer expression was thus vital in helping participants feel more confident (n=4) with PI07 highlighting how queer expression can afford a sense of power: “when I walk through my campus with a set of heeled boots and you hear the click-clack in the echoing of the hall, I feel truly powerful.”

Participants did discuss the adverse outcomes that can arise because of inauthentic queer expression through dysphoria and misidentification. Five participants shared that inauthentic expression can cause disassociation and dysphoria as PI14 equated inauthentic expression to wearing a costume: “When I was leaning into [more masculine dress], it always felt like I was doing cosplay like I was playing what I thought a man
should be.” We also found, quite expectedly, for two of our participants that inauthentic expression often caused misidentification from others.

3.2.2.3 Designing for Queer Expression

3.2.2.3.1 Techniques for Expressing Queerness

Participants provided an abundance of examples of techniques as to how they express their queerness and/or gender identities. Table 3 demonstrates the different categories of items and techniques participants use for their queer expression and their frequency. Table 4 highlights the frequency for items and techniques used specifically for gender expression. Some participants did highlight they actively choose not to use accessories (n=2), devices (n=2), or makeup (n=1) when expressing their queerness.
Table 3 – Frequencies of Items and Techniques used for Queer Expression

<table>
<thead>
<tr>
<th>Item/Technique for Expression</th>
<th>Frequency (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>14</td>
</tr>
<tr>
<td>Hair &amp; Grooming</td>
<td>9</td>
</tr>
<tr>
<td>Accessories</td>
<td>8</td>
</tr>
<tr>
<td>Stickers</td>
<td>6</td>
</tr>
<tr>
<td>Décor</td>
<td>4</td>
</tr>
<tr>
<td>Language</td>
<td>4</td>
</tr>
<tr>
<td>Behaviour</td>
<td>3</td>
</tr>
<tr>
<td>Queer Media &amp; References</td>
<td>3</td>
</tr>
<tr>
<td>Movement</td>
<td>3</td>
</tr>
<tr>
<td>Tattoos</td>
<td>3</td>
</tr>
<tr>
<td>Drag</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 4 – Frequencies of Items and Techniques used for Gender Expression

<table>
<thead>
<tr>
<th>Item/Technique for Expression</th>
<th>Frequency (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>7</td>
</tr>
<tr>
<td>Accessories</td>
<td>4</td>
</tr>
<tr>
<td>Hair &amp; Grooming</td>
<td>2</td>
</tr>
<tr>
<td>Pronouns¹</td>
<td>2</td>
</tr>
<tr>
<td>Behaviour</td>
<td>1</td>
</tr>
<tr>
<td>Tattoos</td>
<td>1</td>
</tr>
<tr>
<td>Drag</td>
<td>1</td>
</tr>
<tr>
<td>Strength (physical)</td>
<td>1</td>
</tr>
<tr>
<td>Jewelry</td>
<td>1</td>
</tr>
</tbody>
</table>

3.2.2.3.2 Barriers to Queer Expression

Eleven participants highlighted problems of social stigma and biases as barriers to queer expression, often rooted in greater issues like misogyny (PI14), religious-based prejudice (PI01, PI15), familial judgment (PI07). Participants highlighted that the stigma and social discrimination against many queer individuals can often cause issues of safety (n=10), societal misconceptions and stereotypes (e.g., gender binary and roles) (n=8), and the fear of judgment and harassment (n=10). PI03 and PI11 shared similar anxieties when

¹ It is important to acknowledge that we recognize pronouns do not equate to gender [107], rather the sharing and use of these participants’ pronouns was discussed as affirming means of expression for them.
wearing expressive items because they “don’t want to be the target of the topic. That’s one of the reasons when I consciously hide my identity” (PI11).

In addition, six participants discussed personal issues that can cause barriers to an expression such as a lack of energy. PI14 highlighted that: “it takes a lot of energy to express yourself… I might even say labour to a certain degree.” We also found that for some participants, the difficulty in expression simply arises from the complexity that comes with queer identity nuances (n=2) and the challenges of understanding one’s own personal identities (n=3).

### 3.2.2.3.3 Considerations for Designing Expression

Our participants shared a plethora of design qualities that would enhance, support, and alleviate barriers to queer expression. Table 5 displays the design considerations discussed more than once amongst participants.
### Table 5 – Design Considerations for Queer Expression

<table>
<thead>
<tr>
<th>Design Consideration</th>
<th>Frequency (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptability</td>
<td>9</td>
</tr>
<tr>
<td>Personal</td>
<td>8</td>
</tr>
<tr>
<td>Customizability</td>
<td>7</td>
</tr>
<tr>
<td>Practicality</td>
<td>5</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>5</td>
</tr>
<tr>
<td>Authentic</td>
<td>5</td>
</tr>
<tr>
<td>Array of Options</td>
<td>5</td>
</tr>
<tr>
<td>Gender neutral</td>
<td>4</td>
</tr>
<tr>
<td>Fluid</td>
<td>4</td>
</tr>
<tr>
<td>Meticulous</td>
<td>3</td>
</tr>
<tr>
<td>Masculine</td>
<td>3</td>
</tr>
<tr>
<td>Design by Queer Community</td>
<td>3</td>
</tr>
<tr>
<td>Queer Semiotics</td>
<td>3</td>
</tr>
<tr>
<td>Socially Identifiable</td>
<td>2</td>
</tr>
<tr>
<td>Hardware</td>
<td>2</td>
</tr>
</tbody>
</table>

Nine participants highlighted the importance of adaptability so they can easily and quickly adjust expressive elements for different contexts. PI01 exemplified this as necessary for preserving one’s safety: “There will need to be a discreet feature if someone feels unsafe with displaying to an individual who might be aggressive or violent.” Seven participants additionally shared that customizability was necessary for
being able to easily change devices to fit personal identities, desires, and lived experiences. When discussing smart devices that could leverage queer expression, PI13 said: “being able to have opportunities to make them your own and exactly how you want to because, obviously, queer expression is so varied.”

Participants shared a variety of concrete examples that should be implemented for queer expressivity, such as having multiple expressive options and queer semiotics. PI02 stated that including multiple options around things like pronouns could help in alleviating barriers surrounding a lack of public knowledge: “Allowing the option to put in what most resonates with us like having examples [of pronouns] because not everyone knows what they are and they get confused.” Three participants also shared that the inclusion of queer semiotics could be beneficial in supporting queer expression, with a common example being pride flags (PI03, PI05, PI15).

Additionally, we observed an interesting back-and-forth between practicality and aesthetics. Five participants highlighted a desire for their queer expression to be practical in nature. For instance, PI02 stated that practicality is more important in the items they wear and use when compared to queer expressivity: “I think it’s nice when I can have things reflect who I am, but practicality is going to override that any day because I value that a lot more.” We found aesthetics to also be an important factor for the queer expression of our participants (n=5). PI06 emphasized the importance of aesthetically pleasing elements even sharing that, despite identifying as non-binary, they hesitate to use the non-binary pride flag in daily expression: “I hate the non-binary flag. I think it’s honestly very aesthetically unappealing.”

3.2.3 Wearables and Expression
We now reflect on different themes surrounding the intersection of wearable design and queer expression, as highlighted by our participants. Figure 7 demonstrates the thematic relationship between the different themes. We provide insights regarding established avenues for digital expression used by our participants and expressive modifications for digital devices.

![Thematic Relationship for Wearables and Expression Themes](image)

**Figure 7 - Thematic Relationship for Wearables and Expression Themes**

### 3.2.3.1 Avenues for Digital Queer Expression

While fourteen participants indicated using SNSs for digital queer expression, four participants shared how the device hardware, through colour and shape, can cater to their queer expression. PI02 and PI08 discussed the colour of devices that communicate different penchants for stereotypically masculine or feminine preferences. For PI02, they did so to combat these stereotypes: “I’ve been experimenting a little bit more with colours [of my devices] … I want to challenge toxic masculinity.” Similarly, we found hardware shape important for queer expression through devices. Not only did they share a
proclivity for Apple devices over Windows “because of how unisex it looks,” PI11 shared that their camera reflects their queerness because of its utilitarian appearance: “It’s heavy, it’s big, and, if I had to gender it, it would definitely be masculine. It’s something I absolutely love, not just in terms of how big it is but it’s also rugged.”

3.2.3.2 Expressive Modifications for Digital Devices

Our participants shared a variety of device modifications they make to their devices to promote queer expression. We observed these to range from hardware modifications using accessories like straps, stickers, and cases to software modifications. For wrist-based wearables, five participants discussed replacing the default wrist strap with one that is explicitly queer-coded (e.g., “rainbow” (PI12) or “flag-based” (PI15)). Similarly, four participants shared that they added stickers to their devices to aid in expressing themselves. PI06 stated that utilizing stickers is not only a successful way of queering their tech, but also facilitating social interaction: “I’m big into stickers, I have a lot of stickers on all my tech… My tablet has a whole bunch of queer stickers that often generate great conversation with my colleagues who wanted to learn more.” Participants similarly used different device cases for expressing queerness (n=3) in addition to software modifications such as using backgrounds (n=1) and changing the voice of smart assistants to reflect their gender expression (n=1) better.

Participants did, however, discuss barriers to queer expression through wearables attributed to a lack of queer options and physical bodily limitations. We found a lack of available meaningful queer expressive options to be the most common technical barrier (n=5). Two participants shared that queer expression through wearable devices is particularly challenging due to a lack of meaningful options, particularly for health and
accessibility wearables. PI06 stated: “Yes we talked about advancements in medical tech, but most of this is still just neutralized.” Three participants additionally highlighted that their bodies could have a negative impact on how they choose to express themselves. PI13 shared potential issues that arise balancing both limited expressive options and underrepresented queer bodies: “for a lot of people it’s just not an option in terms of like gender expression. Like if you’re AFAB and trying to look more masculine, finding clothes that fit a curvy body but also look masculine is always a struggle.” PI03 stated that many fitness wearables are limiting because of a reliance on sex binaries forced upon the wearer: “When you set up a device, something like [my Garmin watch], you have to pick whether you’re male or female, it’s like ‘wait what are my other options?’”

3.2.4 Summary of Phase One Findings

In this phase, we were interested in exploring R1 (How does the queer community practice the expression of their queerness) and R2 (How can wearables be designed to best support queer expression). Through discussion on wearable use and design, we gained a deeper understanding of the queer community’s familiarity with wearables. We observed the importance of designing for considerations such as safety, usability, and accessibility.

Additionally, in exploring topics of queerness and expression, we noted insights into queer lived experiences as they relate to the individual’s connection to the queer community and perceptions of queer identities and their evolutions. Participants shared different motivations and barriers to queer expression and the practice itself as something distinct from the queer identity that is a result of a variety of factors such as one’s environment and sociocultural context. In discussing how they express queerness, our
participants also shared design considerations for expressivity, emphasizing adaptability, aesthetics, and customizability.

Finally, we observed conversations on wearables and expression related to avenues for digital expression and expressive modification of devices. While social media proved to be a popular means of digital queer expression, participants highlighted personal connections to hardware qualities like shape and colour. They similarly discussed device hardware as the most popular avenue for modifying their device to be queerer while simultaneously sharing different queer expressive barriers with wearables.

In the next chapter, we present the second phase of our study, utilizing body mapping to elicit richer conversations on the impact queer bodies has on expression and queer wearable ideation. Using user-generated body maps, we had our participants explore conversations on queer bodies and wearables by sketching their current queer expressive practices as they relate to their physical bodies and to design future wearables that would improve that expression. We carried out the second phase study address minimal or missing conversations on these topics following the analysis of our first phase data.
Chapter 4: Study 2: Body Maps

While the first phase of our study was beneficial in eliciting rich insights into experiences and opinions on queer expression and wearables, we observed challenges in design ideation in an interview setting. Thus, we began a second phase of the overall project to further explore the wearables the queer community desired. In our second phase, we held fifteen individual online body mapping workshops with a diverse representation of the queer community. We begin this section by discussing the methodology explored in the second phase, including our participant demographics, data collection, and data analysis techniques. Secondly, we share the findings from the body mapping workshops. We will cover topics on queerness and expression, queer bodies and expression, and envisioning queer wearables.

4.1 Methodology

4.1.1 Participants

Utilizing the same recruitment methods as the first study, we recruited fifteen participants to participate in our online body mapping workshops. All participants were English-speaking adults over 18 who identified as members of the 2SLGBTQIA+ community or any other identities that fall outside of cisgender and heterosexual. Table 6 displays a summary of the participants’ demographics. Aside from two participants, all participants in this study had not participated in the first phase. To help differentiate from previous participants, pseudonyms for those who participated in the body mapping phase of the project follow the format “PB#.” It is again important that we state that all demographic information provided is as stated by the corresponding participant and not arbitrarily categorized by the researchers. We compensated participants for their time with a CAD
20 electronic gift card to the online retailer of their choice. CUREB-B approved this study (Clearance #116259).

**Table 6 – Study 2 Participant Demographics**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Gender</th>
<th>Trans. (History)</th>
<th>Sexuality</th>
<th>Race/Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB1</td>
<td>22</td>
<td>Man</td>
<td>No</td>
<td>Bisexual</td>
<td>Filipino-Chinese</td>
</tr>
<tr>
<td>PB2</td>
<td>25</td>
<td>Non-Binary</td>
<td>No</td>
<td>Pansexual, Queer</td>
<td>Black American</td>
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<tr>
<td>PB3</td>
<td>30</td>
<td>Woman</td>
<td>Yes</td>
<td>Queer</td>
<td>East Indian, Asian Indian</td>
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<td>PB4</td>
<td>34</td>
<td>Man</td>
<td>No</td>
<td>Gay</td>
<td>South Asian</td>
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<td>PB5</td>
<td>24</td>
<td>Woman</td>
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<tr>
<td>PB6</td>
<td>21</td>
<td>Trans Masculine</td>
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<td>Bisexual</td>
<td>Asian</td>
</tr>
<tr>
<td>PB7</td>
<td>31</td>
<td>Non-Binary</td>
<td>No</td>
<td>Queer</td>
<td>White</td>
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<tr>
<td>PB8</td>
<td>32</td>
<td>Man</td>
<td>No</td>
<td>Queer, Bisexual</td>
<td>Indian</td>
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<tr>
<td>PB9</td>
<td>23</td>
<td>Non-Binary</td>
<td>No</td>
<td>Queer</td>
<td>Arab</td>
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<td>PB10</td>
<td>30</td>
<td>Genderpunk, Genderqueer</td>
<td>Yes</td>
<td>Demisexual</td>
<td>White</td>
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<tr>
<td>PB11</td>
<td>23</td>
<td>Non-Binary</td>
<td>Unsure</td>
<td>Lesbian</td>
<td>White</td>
</tr>
<tr>
<td>Participant</td>
<td>Age</td>
<td>Gender</td>
<td>Trans. (History)</td>
<td>Sexuality</td>
<td>Race/Ethnicity</td>
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<td>PB12</td>
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<td>Black, Indigenous</td>
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<td>PB13</td>
<td>26</td>
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<td>No</td>
<td>Queer</td>
<td>Mixed</td>
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<td>PB14</td>
<td>57</td>
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<td>No</td>
<td>Gay</td>
<td>White</td>
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<tr>
<td>PB15</td>
<td>31</td>
<td>Non-Binary</td>
<td>No</td>
<td>Biromantic, Asexual</td>
<td>Asian (Canadian Chinese)</td>
</tr>
</tbody>
</table>

### 4.1.2 Data Collection

We collected data via one-on-one, online body mapping workshops with each of the participants. Three participants opted to use Google Meet, with the other twelve choosing Zoom as their teleconferencing platform. We recorded all workshops, and they lasted, on average, 40 minutes (shortest = 20m 15s, longest = 52m 50s).

We yet again provide a methodological rationale for the different workshop sections but provide the full workshop guide in Appendix C. Figure 8 visually displays the overall structure and steps of the first phase of the study.
Demographics. For similar diversity purposes as before, we began our workshops in the same manner as our interviews by asking our participants for their demographic information. We utilized the same demographic questionnaire as presented in the interview phase of the project.

Stream of Consciousness Brainstorming. To help encourage the flow of ideas before the main research activity, we organized a stream of consciousness activity. Using a
maximum of five minutes, we asked our participants to freely write about their queer expression. Borrowing on techniques from first-person diary studies, we designed a stream of consciousness activity to have participants recall the breadth of their queer lived experiences allowing them to write any concepts without the added cognitive load of organizing and correcting their ideas [26,131,138]. Many participants took this opportunity to also write about different aspects of their queerness.

*Body Mapping Preparation.* Following the stream of consciousness, participants were then walked through a series of detailed instructions to prepare for the main body mapping research activity. Drawing two pairs of body outlines to represent the front and back of their present and future bodies, the only constraint we gave participants was to create outlines large enough to sketch within. We encouraged participants to create their outlines in any colour, shape, or position they deemed meaningful to increase the likelihood of receiving artifacts that better represented a diverse set of bodies.

*Body Mapping Exercise.* The main body mapping activity was divided into three sections: two sketching prompts and a final reflection period.

The first prompt utilized the *Present* outlines to explore the participant’s current methods of queer expression as they relate to their body. We encouraged participants to consider how their dress or physical bodies might connect to their queerness. We provided additional sketching probes, such as how their expression may have changed over time and the reasons they might choose to express themselves.
The second prompt used the *Future* outlines to have participants design queer wearables that could help them express their queer identities. We gave no limitations regarding the creativity of designs to gain an unobstructed understanding of the wearables the queer community desires. We again provided design probes such as device functionality, appearance, and user-device interaction. For both sketching activities, we allowed participants to sketch environmental influences, not on their physical bodies that they deemed critical to their lived experiences.

Following the sketching, participants were asked to reflect on their sketches with the lead researcher. This allowed participants the opportunity to explain their sketches in detail while the lead researcher could probe them for further information on complex concepts discussed by the participant.

*Post-Workshop Directed Questions*

To conclude the workshop, the lead researcher asked the participant three final directed questions. Question topics covered the relationship between their present expression and the envisioned wearable, the role that queer semiotics play in present expression and the devices they designed, and different barriers their wearables might address.

4.1.3 **Data Analysis**

As a result of the generation of both workshop transcripts and body map artifacts, we coded the visual body maps and transcripts separately and independently of each other.

*Transcript Analysis*. Akin to the first phase, all participants consented to the use of the transcription software *Trint* to help accelerate the transcription process, which we used to transcribe fourteen workshop recordings [135]. While P15’s recording audio was
corrupted, the lead researcher was able to create a pseudo-transcript from thorough notes taken during the session. The lead researcher then completed an identical process of data familiarization, thematic analysis, and visual code organization as conducted in 3.1.2 Data Collection.

Body Map Analysis. Following the workshop sessions, each participant provided the research team with photos of their body maps. Utilizing the online whiteboarding tool Miro, the lead researcher uploaded and recreated the participants’ body maps using genderless body outlines to aid with data comparison amongst participants.

We analyzed participant-generated body maps separately to textual transcripts using a process of thematic analysis similarly inspired by the polytextual thematic analysis developed by Paula Reavey [50]. Using a visual approach, the lead researcher created codes based on different aspects of participant body maps and visually connected the relevant codes using specific colours, icons, and labels. To ensure the validity of the approach, the lead researcher and another researcher began the process independently with two sets of body maps, each establishing a relevant initial code frame. The two then connected to review and redefine the code frames collaboratively. The lead researcher then repeated the same process independently for the rest of the body maps, at each stage reviewing and redefining the code frame until further changes were no longer necessary. Codes were then visually organized into larger themes based on how the themes organized concepts established during thematic analysis.

4.2 Findings

In response to our research questions, we found three themes: queerness and expression, queer bodies and expression, and envisioning queer wearables for the community. We
break down each theme into subcategories such as framing queerness, framing queer bodies, and wearables for the queer community. Figure 10, Figure 11, and Figure 20 visually represent the relationship between subcategories of each respective theme. We removed filler words in participant quotes to enhance readability. Figure 9 depicts the thematic relationship between all major themes.

4.2.1 Queerness and Expression

We observed yet another intricate relationship of factors providing a deeper insight into queerness and expression. While there were subcategories that were unique to the second phase, we found the thematic structure to be same. We begin by elaborating on the initial framing of queerness and expression, respectively. We then continue the conversation surrounding the design of queer expressivity.

Figure 9 - Thematic Relationship of Body Map Workshop Findings
4.2.1.1 Framing Queerness

Participants provided insights that elaborated on the previously established framing of queerness. Discussions focused on dimensions of queer lived experiences and the relationships between queerness and other identities such as Blackness and neurodivergence.

4.2.1.1.1 Queer Lived Experiences

Each participant shared a variety of experiences or qualities that played a role in characterizing queer lived experiences. We found these experiences to centre on conversations surrounding the queer community, the fluidity of queerness, and challenges faced by queer individuals.
Community. Eleven participants discussed different aspects of the queer community as it relates to their lives as queer individuals. Participants’ conversations on the queer community highlighted different communal practices and social engagement within the community. Five participants discussed common community-wide practices that certain queer individuals participate in. PB11 exemplified this when discussing how they flag queerness amongst their queer friends using a limp-wristed hand motion: “Me and my queer friends, often when we're trying to convey queerness in general, we'll do that motion. And it's like ‘Oh my gosh, that's queer’”.

Four participants furthered the discussions of the community aspect of queer lived experiences as it relates to engaging with other queer individuals. This was exemplified as how to “navigate queer platonic relationships” (PB02) while three participants all stressed a sense of community support through “checking in with each other, community trust, recognizing where we've come from and where we're going” (PB10). PB07 did emphasize, however, that the queer community is not without its own inter-communal differences. They exemplified this with ongoing debates as to the “proper” physical representation of non-binary expression: “you also get into intergroup, interpersonal stuff. It's a conflict of, for me personally, not looking non-binary enough, whatever that means.”

Fluidity of Queerness. Six participants highlighted how the concept of fluidity help characterizes their queerness. PB07 contrasted queerness’s fluid nature against that of heteronormativity: “Heteronormativity is small, constrictive, death obsessed and fascist. While queerness is vast, ephemeral, outlasting and uncategorizable.” PB03 and
PB14 also added that fluidity comprises an intricate balance of degrees of visibility. This was particularly relevant for PB03 as they constantly must determine how safe it is for them to enter a new space as they continue along their gender transition.

*Challenges during Queer Lived Experiences.* When discussing queer lived experiences, five participants felt the need to emphasize challenges such as deception, a lack of resources and support systems, and health concerns.

For four participants, navigating a heteronormative world is an everlasting challenge exemplified in a recurring need to engage in deception with non-queer individuals: “On more of a negative side is hiding parts of myself. Covering things up and lying to cisgender-heterosexual people” (PB02). PB02 and PB06 additionally stated that queer individuals are often more likely to experience a lack of resources and support systems. PB02 stated: “I know that for queer people, often support systems are not always there, and sometimes you have to just do a lot of shit by yourself.” For PB02 and their social circle, this often would instill a sense of hyper-independence manifesting in certain queer individuals having "trouble asking for help and trouble building a queer support system."

4.2.1.1.2 Other Identities

For seven participants, there exists an intricate relationship between their queerness and others lived experiences. For four participants, it was important for them to establish that queerness is not their entire being. Three participants carried this idea further by stressing the idea of queerness being a part of a larger whole when talking about their identities. PB05 stated this: “Being queer is not who I am. That is *part* of who I am.”
As such, participants also explored how queerness mixes with other identities. PB02 discussed this as a Black queer person: “I would say the way I express my queerness now is definitely my hair… I don't know, afros are not inherently queer, but for me they kind of are.” PB03 likewise shared how much of who they are as an individual finds itself in cultural influences: “Because I'm from Sri Lanka, which is an island. I enjoy a lot of the things that shaped me like culture, food, music, people, things I have seen, the things I grew up with.” PB11 similarly expressed their queerness as something that works with their neurodivergence: “a big part of my queer identity is within neurodivergent queer spaces, particularly because I'm going through the process of getting diagnosed with autism and I have ADHD and other things that make me neurodivergent. So that's [where] a lot of my queer identity is coming from.”

4.2.1.2 Framing Expression

As in the first phase, we observed a multitude of reasons for which our participants choose to express their queerness, particularly for queer visibility, again in avoiding misidentification (n=4) and queer visibility (n=3). We also again noted that participants sharing their queer expression is subject to a process of evolution over time (n=4), becoming more or less prominent as one’s perception of their identity changes (n=2). Participant conversations on framing expression focused heavily on unique barriers and outcomes of queer expression.

4.2.1.2.1 Barriers to Expression

Akin to the first phase of the study, our participants stressed several barriers that interfere with their queer expression with recurring barriers along the lines of societal biases,
cultural influences, and personal perception. Societal level barriers again included concerns with public perception (n=5), gender roles (n=3), and discrimination (n=4).

Four participants again highlighted that many barriers to queer expression can also be traced back to cultural factors. PB02, however, uniquely exemplified this with the struggles of having to cope with policing of their Black expression and their queerness together: “The way that Black people present themselves is policed globally…it's like we get flamed if we're wearing afros, and then we get flamed if we wear wigs.”

We observed recurring personal factors that lent themselves to imposing barriers on our participants’ queer expression such as personal understandings of one’s queerness, internal biases, and bodily limitations. Seven participants discussed their own understanding and perception of their queerness (n=2) and bodies (n=2) as being something that can negatively impact their expression. In a like manner, four participants expressed how their physical form or voice prevented them from experiencing meaningful queerness. PB09 exemplified bodily barriers when discussing a duality between admiring and disliking their breasts: “Sometimes I feel like [my breasts] are keeping me back from my full form. But then sometimes I love my boobs… With a lot of non-binary people that present female, this is a big thing the ‘oh, my chest is really keeping me back from being who I want to be.’”

Such as in the first phase, we similarly observed factors of items designed for queer expression that introduce their own barriers regarding queer expression, particularly a lack of options with aesthetics and functionalities. While the poor aesthetics of queer semiotics was reintroduced, PB06 and PB08 instead highlighted concerns of limited expressive options as an issue with the functionality of clothing. PB06 expressed
frustrations with the lack of clothing that can support a Stand-to-Pee device: “The issue is there's no underwear or pants that really work with them. There’s nothing that I currently would feel comfortable using at a urinal.”

4.2.1.2.2 Outcomes of Expression

Similar to findings from the first phase, participants highlighted a variety of outcomes of queer expression, with the most common benefit being a feeling of euphoria (n=4). Two participants did, however, share that queer expression, and by extension euphoria, allowed them to gain a deeper understanding of themselves. PB07 discussed this growth as healing: “And I think queerness allows for restoration and healing in this way. I have experiences of having grown up as a teen girl and I've had anorexia when I was younger. And this was something I had to overcome in terms of how I relate to my body. And I think being queer helped with that a lot.”

Two participants added that queer expression helped them feel a stronger connection with the rest of the queer community. For PB06, this was particularly noticeable with queer expression through language creating a safe space for queerness around them: “In terms of my current expression, I do think that like queer talk creates a safe space that can make someone feel like they’re almost a part of this community.”

4.2.1.2.3 Factors Impacting Expression

We observed a variety of factors that might influence how our participants choose to express their queerness along societal, cultural, social, personal, and aesthetic dimensions.
While we observed multiple reoccurring societal and cultural norms from the first phase, three participants shared that women’s beauty standards, in particular influence their expression. For PB02, this manifested as a compulsory adherence to beauty standards: “I, as a very femme person, fall into the beauty standards of women and I very much feel pressure to be a part of that.” Eight participants yet again shared the impact their immediate social setting has on their queer expression, requiring practices such as code-switching language (PB13) and negotiating the visibility of different expressive items (PB06).

We observed an individual’s understanding of their queerness to yet again be a common factor in influencing how they express themselves. Two participants, however, shared unique perspectives on understandings of queer bodies by characterizing them as “malleable, changeable spaces through therapy [and] body modding” (PB07) and an “art gallery [where they] decide what goes in it.” Furthermore, two participants stressed that a sense of privilege would influence one’s queer expression. Interestingly, PB08 stated that privilege influences how they choose to represent and engage with the queer community: “I have power where I teach, I am representing the Ph.D. body. This privilege, how I am using it or how it is being disseminated is something I consider a lot. I think in terms of this notion of giving voice.”

Four participants again highlighted how their understanding and expression of other non-queer identities influence their queer expression. PB11 similarly shared how the understanding of their neurodivergence intersects with their queerness, while PB02 provided deeper insight into the balance of queerness and Black expression. They stated:
“There is no there's no appearance for [Black queer and trans* people] that's going to be acceptable under white supremacy. We have to deal with that on top of our queerness.”

4.2.1.3 Designing for Expression

4.2.1.3.1 Techniques for Queer Expression

Participants yet again provided numerous examples of techniques as to how they express their queerness. Table 7 displays the different categories of items and techniques participants highlighted for their queer expression and frequency. Several participants did express that they chose not to use queer semiotics (n=3), their bodies (n=2), and makeup (n=1) when expressing their queerness.
<table>
<thead>
<tr>
<th>Item/Technique for Expression</th>
<th>Frequency (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>13</td>
</tr>
<tr>
<td>Hobbies/Activities</td>
<td>11</td>
</tr>
<tr>
<td>Hair &amp; Grooming</td>
<td>10</td>
</tr>
<tr>
<td>Accessories</td>
<td>9</td>
</tr>
<tr>
<td>Queer Semiotics</td>
<td>7</td>
</tr>
<tr>
<td>Body Modification (e.g., tattoos, piercings)</td>
<td>7</td>
</tr>
<tr>
<td>Language</td>
<td>5</td>
</tr>
<tr>
<td>Community/Social Circle</td>
<td>4</td>
</tr>
<tr>
<td>Wearables</td>
<td>4</td>
</tr>
<tr>
<td>Bright Colours</td>
<td>4</td>
</tr>
<tr>
<td>Body/Voice</td>
<td>4</td>
</tr>
<tr>
<td>Gender Role Subversion</td>
<td>3</td>
</tr>
<tr>
<td>Makeup</td>
<td>3</td>
</tr>
<tr>
<td>Romance/Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>Action</td>
<td>3</td>
</tr>
<tr>
<td>Décor</td>
<td>2</td>
</tr>
<tr>
<td>Culture</td>
<td>2</td>
</tr>
<tr>
<td>Assistive Devices</td>
<td>2</td>
</tr>
<tr>
<td>Femininity</td>
<td>1</td>
</tr>
<tr>
<td>Name</td>
<td>1</td>
</tr>
</tbody>
</table>
4.2.1.3.2 Considerations for Expression

Our participants once again shared a variety of design qualities they believe support queer expression. Table 8 displays the design considerations our participants discussed. We observed popular discussions to fall under the categories of practicality, visibility, personal connections, aesthetics, and balancing external and internal expression.

Table 8 - Design Considerations for Queer Expression

<table>
<thead>
<tr>
<th>Design Considerations</th>
<th>Frequency (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practicality</td>
<td>3</td>
</tr>
<tr>
<td>Visibility</td>
<td>3</td>
</tr>
<tr>
<td>Personal</td>
<td>3</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>2</td>
</tr>
<tr>
<td>External</td>
<td>2</td>
</tr>
<tr>
<td>Internal</td>
<td>1</td>
</tr>
<tr>
<td>Body/Voice</td>
<td>1</td>
</tr>
<tr>
<td>Multiple Options</td>
<td>1</td>
</tr>
</tbody>
</table>

We observed a unique relationship between considerations of authentic expression and aesthetics. Three participants stated that items and techniques they express themselves must retain a personal element. PB07 shared that for them the personal nature of expression manifests in a feeling of it being “interesting,” instead of visually appealing: “I think more than anything else, it's about it being interesting. It doesn't have to be about being beautiful.” Two participants, however, did emphasize that aesthetics still played an important role in queer expression. PB02 shared that, despite
identifying as non-binary, they prefer the modern pride progress flag for aesthetic reasons: “I don't really like the non-binary flag colours that much. But I would do the new pride flag. I would use that one.”

Building off discussions of adaptability in the first phase, three participants shared that allowing for varying degrees of visibility is also crucial for expressive items. PB14 stated: “It is not always the big and the bold and the shiny. Much of it may be a great deal of subtlety, that's also expressing one’s identities.” PB06 exemplified this idea when discussing the connection between visibility and aesthetics with preferences for a particular shoe style: “Unisex shoes were a way for me to wear what I wanted without being judged. I would always wear vans since I knew it was like a safe bet.”

We also observed certain conversations regarding considerations for queer expression that negotiate the external and internal expression. PB10 and PB13 divided their styles of expression between external and internal with a “haircut for something a little bit more superficial” (PB10). PB10 also exemplified several examples of queer expression they characterize as internal: “What a lot of it boils down to is people taking care of each other … Trans-affirming, taking up space, seating space and listening to understand not to win.”

4.2.1.3.3 Queer Semiotics

Participants discussed a variety of characteristics of queer semiotics as they relate to the practice of queer expression, particularly in their recognizability and ease of use. PB11 and PB12 agreed that queer semiotics offers the benefit of an easily recognizable means of expression. PB12 stated: “It is one of those things, like if you know, you know. If you put a rainbow on something, [cis-het] people will look at it and question if it's gay. We
know that it’s a symbol.” PB06 also described queer semiotics as a potentially subtle means of expression that queer individuals have an innate ability to detect: “I don't even know. It's hard to explain what the symbols are since you just kind of pick up on them.”

It is worth mentioning, as well, that two participants discussed pitfalls regarding the use of queer semiotics. For PB07, queer semiotics, particularly those associated with rainbows, are often overused: “I think a lot of times with like how we express ourselves and how we wear things is I get a lot of people saying they're sick and tired of seeing rainbow stuff and I get that it can be obnoxious.”

4.2.2 Queer Bodies and Expression
Through our body mapping activity, we observed participant perspectives that offered a deeper understanding of queer bodies and expression. Much like findings on queerness and expression, we provide an initial framing of the queer community’s understanding of queer bodies. We do this by providing a series of heat maps highlighting the frequency of different observed themes and the bodily location participants attributed to them. These themes covered conversations such as queerness as physical features or sensations, queer wearables and the bodies, and physical considerations for technological and biological I/O.
4.2.2.1 Framing Queer Bodies

We present a visual framing of queer bodies as discussed by our participants. Each visualization displays a heat map overlaid onto a body map demonstrating the different areas of queer bodies associated with eight observed themes, including I/O, queerness as different physical features or sensations, and the bodily placement of envisioned queer wearables. Each visualization has a legend displaying the correlation between colour and frequency (e.g., red representing the highest possible frequency of five).

“Queerness” as Physical Features

Our participants discussed parts of their anatomy associated with their queerness and queer expression. Figure 12 displays the heat maps highlighting the parts as discussed on the front and back and their respective frequencies.
"Queerness" as Physical Sensations

Participants similarly shared different physical sensations they correlate with aspects of their queer lived experiences. Examples include PB10’s association of their socio-masculine jawline as carrying a feeling of “strength” while PB08 discussed the feeling of “freedom” when wearing clothing that expressed their queerness. Figure 13 presents the visualizations of the respective heat maps showing the frequencies of these discussions.
Figure 13 - Front and Back Heat Maps of "Queer" Bodily Sensations

“Queerness” as Mental and Emotional Sensations

Figure 14 shows the heat maps visualizing body parts our participants discussed housing different mental or emotional sensations. The sensations included examples such as PB04 drawing the feeling of their chest housing queer compassion while PB02 experiences mental conflicts with expression in their mind.
Queer Wearables

In envisioning different queer wearables, our participants highlighted different parts of queer bodies that would feature, utilize, or benefit from queer wearables. Figure 15 displays the heat maps that exemplify the different areas of queer bodies used for future queer wearables.
Participants mentioned a variety of I/O techniques for queer wearables, both technological and biological.

Figure 16 displays the front and back heat maps highlighting the different areas in which technological input is implemented. External examples of technological input included one use of environmental temperature (PB03) sensing and three references to application-based input. Both discussions of wrist-based input centred on using an external smartwatch to provide input for the main device (PB04, PB06).
Figure 17 shows similar visualizations for technological output on different locations on queer bodies. Examples include identity displaying devices situated on the chest (PB10), a shirt with a customizable display on the upper body (PB14), and height-adjustable shoes on the feet (PB02).

Figure 16 - Front Heat and Back Heat Maps of Technological Input on Queer Bodies
In a like manner to technological I/O, participants highlighted different parts of their queer bodies that would feature biological I/O.

Figure 18 displays the front and back heat maps highlighting the different areas of queer bodies in which biological input is gathered. Biological input included taking the user’s chest and shaping it with a tech shaper or binder, altering the user’s voice through a wearable inserted into the mouth, and collecting emotional data through a device placed on the biceps.
Figure 19 shows similar visualizations for biological output on queer bodies. Examples of biological output included readjustments of the user’s spine or chest, aesthetic customizations of the user’s hair, and emotion-reflective tattoos implemented through the body.

Figure 18 - Front and Back Heat Maps for Biological Input on Queer Bodies
Figure 19 – Front and Back Heat Maps for Biological Output on Queer Bodies
4.2.3 Envisioning Wearables for the Queer Community

We now present our participants’ wearable designs. We use specific examples of the user-generated designs to highlight our participants’ desire for future wearables as they fall into one of four major categories of designing for: (1) expression and communication, (2) changing bodies, (3) managing queer health, and (4) finding others. We build off participant reflections to highlight important design qualities of queer wearables along the dimensions of supporting queer lived experiences, expression, bodies, and functionality. We similarly note barriers our participants shared regarding queer wearables such as data safety and poor aesthetics.
### 4.2.3.1.1 Queer Wearable Solutions

*Wearables for Expression and Communication*

**Customizable and Adaptive Clothing.** Most participants expressed the desire to have customizable clothing to enhance their queer expression. PB02, PB04, and PB14 all envisioned this style of queer wearable as allowing the user to customize the fabric of the clothing for aesthetic purposes (Figure 21). PB04 shared: “Having clothes in the future that can change colours according to what you feel that day or what your mood is would be a great way to show your expression.”

![Figure 21 - PB14 Future Body Map](image)

PB03 and PB08, however, conceived adaptive clothing that grants the wearer the opportunity to express themselves through more functional means. For example, PB08 discussed clothing that could change in tightness to help with cycling: “like a cloth which is tight, and you can wear it while cycling, but when you push the button, it automatically makes it a dress” (Figure 22).
Mood Reflective Devices. Three participants designed mood reflective queer wearables that could express emotional states. PB01, for instance, designed “colour-changing tattoos or even a colour changing jewelry [that] match the emotion you're feeling” (Figure 23).
Decorated Devices. PB04 and PB11 both focused on the aesthetic qualities that could be given to different wearables to make them expressive. PB04, however, envisioned a greater breadth of devices: “So you can have headphones, glasses, any technology that can show on your queerness that would be great. Even Bluetooth earpieces can have those expressive colours as well. You can have a set of pride flag headphones as well.”

Identity and Metric Displays. PB04 and PB10 created complex designs of queer wearables used to explicitly communicate queer identities to those around them. PB04 conceptualized a customizable badge that would allow for users to display various elements of their queer identity: “Why not have badges that can change their display? People now have pride flag badges and gender badges with pronouns so it'd be great if you can have a badge that's a screen and, on the screen, you can have any display you
want, any label, you might want to have that day.” As one component of a larger intricate system of personal displays, PB10 designed a similar display for queer identities: “The first screen would be whatever your pronouns are that day, because some people, they switch from day to day or event to event” (Figure 24). As an additional layer to the device PB10 designed, they created designs for display of personal metrics they found fundamental to their queer experience. Both displays they envisioned allow the user the opportunity to display sensory information to those around them to serve as an indicator for social availability.

![Figure 24 - PB10 Future Body Map](image)

**Hair Braider.** PB02 envisioned was a wearable hair braiderm (Figure 25). PB02 shared: “It’s a machine to braid my hair. Presently, I love having my hair braided. It’s so low maintenance and I can just like do whatever I want to do with it. [I designed] a wearable hair braiderm because I don't want to be sitting up in somebody's house for8 hours, which
is what I do right now.” We observed this as being particularly useful for the independence it afforded by allowing the wearer to have their hair sectioned and braided. At the same time, they continued with the rest of their day.

![Figure 25 - PB02 Future Body Map](image)

**Gender-Affirming Prosthetic Clothing.** Finally, PB06 conceptualized a wearable that would fill a gap in clothing supporting gender-affirming prosthetics, particularly for packers and Stand-to-Pee devices (Figure 26). They stated: “pants or underwear made for packing and using STPs.”
Wearables for Changing Bodies

Exoskeleton/Mechanical Limbs. One of the two most common wearable ideas was the design of an exoskeleton or mechanical limbs that would attach to the user’s body. Three participants emphasized the importance of these wearables as beneficial to alleviating common complications the queer community faces, such as an “exoskeleton to support you in your life” (PB07) affording the wearer a heightened sense of agency, support, and safety (Figure 27) or addressing physically inaccessible spaces (PB13).
Binder/Body Shapers. The other most common example of wearable devices envisioned to support queer community was three distinct designs for binders and body shapers. P15 designed a vest-body-shaper to help addressing body dysmorphia that would allow the wearer to have, “Their body appears more or less feminine by enlarging or flattening their breasts.” They also designed this with the desire to improve safety for queer individuals entering spaces where their physical bodies do not align with standard societal expectations (e.g., female bodies in a woman’s restroom). PB06 similarly conceptualized a binder wearable that could be interacted with through an accompanying smartwatch. (Figure 26)

Queer Body Modifications. Several participants designed wearables with the intention of modifying queer bodies. PB12 envisioned queer wearables that could serve as body modifications akin to additional limbs. Firstly, they envisioned a set of horns or ears “that respond to your brainwaves” signalling different emotional states and could be
personalized to communicate different queer identities or aesthetic preferences. Secondly, they also suggested the creation of “a tail that has full mobility,” to respond to stimuli in their environment and even offer a level of social interactivity with others by “poking them with the tail” or wrapping it around others to communicate affection (Figure 28).

Finally, PB02 developed a design for a voice-changing wearable aimed specifically for trans* individuals (Figure 25). They stated: “I would want to see for my trans brethren, an automatic voice changer. I wouldn't make my own voice higher or lower, but I think as a wearable for trans people, that would be amazing to just be able to like instantly like change their voice.”

**Wearables for Managing Queer Health**

**Hormone Delivery Regulators.** Three participants conceptualized wearable devices that would cater to the needs of the queer community by offering the functionality of hormone delivery regulation. In addition to monitoring the use of their previously suggested tech binder, PB06 envisioned a smartwatch that offers “reminders for hormones, medication and hydrating” for the user as they believe, “queer people have a lot more things to worry
about, it's better to have something that can [offer reminders]” (Figure 26). PB07 also designed a series of nanobots infused inside the user to provide control of the endocrine system (Figure 27).

**In Vitro Fertilization Belt.** As a result of current difficult experiences with the process of in vitro fertilization (IVF), PB05 outlined a wearable belt that would help alleviate many pain points associated with IVF (Figure 29).

![Figure 29 - PB05 Future Body Map](image)

**Wearables for Finding Others**

**Queer Community Detecting Wearables.** We observed the final category of wearable devices envisioned by our participants to centre on the concept of being able to identify other queer individuals easily and safely in shared spaces. PB02 and PB05 created solutions that focused more on being able to discern the queerness of others around them. PB05 designed smart glasses as “a way of finding queer people around you. So that when you wear them, [you know someone is queer] instead of having those awkward moments of ‘I think you're queer, but I'm not sure’” (Figure 29). PB02 stressed the potential misuse of these devices by malicious third parties and insisted on using selective disclosure.
functionality, allowing individuals to turn on and “off different queer transmission signals.”

4.2.3.2 Designing the Wearables

4.2.3.2.1 Desired Wearable Qualities

Designing for Supporting Queer Lived Experiences. The most common type of wearable qualities we observed was those that strengthen queer experiences, often addressing different barriers queer individuals endure. For instance, six participants emphasized their wearables as designed with the user’s safety in mind. One of the core functionalities of PB05’s mood tracking device was the ability to call a support network when danger is detected: “[The device would] give you options to call a friend for mental health-related [issues]. It would also make sense if you felt like you were in danger, and it would ask if you wanted to call a friend.” PB06 and PB14 similarly stressed bodily safety associated with tightening binders, with PB06 designing cautionary warning measures: “[The wearable] should notice how long you've been wearing it and remind you to take it off, where it asks "Do you want to loosen it" or something like that. Or like let's say even your watch notices you're sleeping, and you have your binder on it then it will buzz and wake you up, so you're not sleeping with it on or maybe make it looser.”

Queer wearables enabling a heightened feeling of independence were also very important for five participants. These conservations all found their roots in having the devices alleviate the user from a sense of labour experienced in their lives. PB02 and PB07’s generated their exoskeleton designs with the goal of carrying out physical labour, such as carrying heavy items, rooted in the sense of “hyper independence” caused by a
lack of support systems for queer individuals. Two participants additionally characterized their devices as being able to support the wearer in managing emotional labour. For PB03, they discussed their designed hormone delivery monitor as offering the opportunity to understand their own emotions better and make informed decisions for how to proceed in social situations: “It’s a way of knowing if I’m experiencing mood swings, I could ask myself ‘should I have personal space’ or ‘do I want to go outside or just walk by myself?’”

Four participants shared that helping navigate social settings and interactions was a beneficial feature that future wearables should offer. Three participants outlined devices that would afford the wearer greater environmental awareness. For PB03, a wearable device like PB02’s bionic eyes would be particularly useful for establishing safe spaces amongst queer individuals: “Let’s say if there is a device that shows there is another trans or queer person in this space, it might make me feel safe to go to those spaces.” Two participants proposed designs to forge connections between individuals. PB12’s designed their wearable cat tail with the intent to interact with others through “poking them with your tail… [or] wrapping your tail around them.”

*Designing for Expression and Visual Presentation.* Participants emphasized enhancing user’s expression and visual presentation through design qualities like customizability, queer semiotics and selective disclosure, and desirable aesthetics.

We noted certain design considerations for queer wearables that pertain to specifically queer experiences via queer semiotics and selective disclosure. For instance, four participants discussed the inclusion of queer semiotics in their envisioned devices.
using pride flags (n=4) and pronoun labels (n=1). Two participants also discussed the idea of building selective queer disclosure into their devices. While discussing their design of bionic eyes and smart glasses that could pick up on other queer individuals, PB02 emphasized the importance of this device allows users to “turn off queer transmission signals” at a moment’s notice.

For eight participants, the important design quality of wearable devices was in the customizability. While three participants discussed customizability in terms of selecting characteristics like colour palettes, two participants emphasized fluidity and designed their device around the notion of providing “a very malleable, changeable technology interface” (PB15). PB10 exemplified this idea using pronouns: “And the first screen it would be whatever your pronouns are that day, because some people, they switch from day to day or event to event.”

*Designing with Queer Bodies in Mind.* Three participants emphasized designing queer wearables to afford users a sense of bodily euphoria. In fact, for PB09’s body modification device, euphoria was the motivating factor in its design: “I wrote euphoria because I feel like a lot of it has to do with gender euphoria… and I think that [my device] would definitely address body dysphoria or dysmorphia.” PB10 and PB13 extended the idea of bodily euphoria when highlighting the importance for designing queer wearables with accessibility in mind: “This [exoskeleton] is meant to [help me] walk in a way that I'm familiar with and in the way that I connected with my queer identity since there's a lot of like physical barriers in being able to be with my community.”
Designing for Functionality. Upon reflection of their wearable designs, five participants emphasized the importance on the functionality the device offers, which PB02 described as “being more functional” than purely aesthetic. PB03 similarly discussed the importance of their designed hormone delivery monitor as less of an aesthetic prop but rather a “personal manager” to help reduce concerns of anxiety and stress.

Additionally, participants reflected on what functional capabilities make their designed queer wearables worthwhile such as user control, external device connectivity, and personal metric visualization. Four participants stressed the ability for the users to have substantial “agency” (PB07) with their wearables, allowing the user to decide what aspects of their queer identity are noticeable from the device and when (PB02, PB14). Three participants also touched upon user control as it relates to I/O in expressing interest in wearables incorporating compatibility with external devices. PB06 and PB14 suggested a smartwatch and app as an external interface to control the operations of the main wearable functionalities. Other noteworthy functionalities discussed by participants included the collection and presentation of personal metrics (n=3) and simple device maintenance (n=2).

4.2.3.2.2 Barriers to Wearables

Many participants again highlighted different barriers to wearable usage. Participants identified these along the dimensions of safety and maintenance, device abandonment due to novelty and lack of functionality, and poor accessibility and aesthetics.

While many participants again shared barriers regarding wearable safety, six discussed explicit concerns with “data collection and privacy” (PB02) for queer users.
Certain fears associated with wearable data tracking of queer users were “ outing people” (PB02), “targeting trans people” (PB06) and physical safety risks (PB07). PB03 discussed this when presenting their design of a hormone delivery monitor: “I do think that this could be a violation of privacy because it’s a lot of personal health identification information being collected… I don’t know if the info being collected would be used against me by the health care industry.” Two participants stressed worries of discrimination because of wearables designed to easily identify queer users. PB11 stated: “You know, neurodivergent people and queer people are all minorities and there are shitty people out there. I guess a barrier [to wearables with queer semiotic decorations] would just be homophobia and ableism and transphobia.”

Additionally, participants shared different concerns with novelty and lack of functionality that would result in device abandonment. Three participants shared concerns in consistent use that devices like smartwatches often require (PB03). PB12, however, specified the novelty of wearables as imposing a barrier to entry: “For barriers, there’s always going to be that feeling of ‘oh, it’s weird and new.’ I mean, when I started dyeing my hair, it was unusual to find people with dyed hair who weren’t punk.” PB06 indicated that a lack of perceived useful functionality has also led them to device abandonment in the past: “For smartwatches, I tried to use smartwatches [but] a lot of the functionality I would like, it just didn’t end up having.”

Like the first phase, three participants highlighted barriers to wearable use due to poor aesthetics. PB07, however, added that wearables designed to promote queer expression run the added risk of worsening stereotypes. They stated: “It could perpetuate a lot of already involved inner group discrimination… Such as ‘I only want this type of
person to engage with [the device],’ a very identarian, atomized way of existing.”

Participants again stressed barriers to wearable usage caused by inaccessibility, both
disability-related (n=4) and cost (n=3).

4.2.4 Summary of Phase Two Findings
In this phase, we sought to explore R3 (How can body mapping as a research activity be
used to generate new knowledge regarding the experiences of queer expression and
wearables?) and R4 (What types of future expressive queer wearables does the queer
community envision?) to address gaps we observed in the design ideation and discussion
of bodily impacts of wearables from the first phase.

We observed similar insights as in phase one regarding the topics of queerness
and expression. We observed unique discussions surrounding the framing of queerness in
the context of fluidity, challenges faced, and the balancing of queerness and other
identities. Akin to phase one, our participants yet again framed queer expression along
the dimension of motivations, barriers, outcomes, and the factors that influence it. Much
like in understanding queerness, participants of phase two emphasized the impact their
lived experiences with other identities has on their understanding and practice of queer
expression. Finally, we observed recurring themes on designing for queer expression but
found a substantial focus on the conversation of queer semiotics, particularly in its
perceived utility and a hesitancy for adoption due to overuse. Additional design
considerations elaborated further on the authenticity and visibility of queer expression.

We noted several fascinating conversations regarding queer bodies and
expression. Our participants provided a variety of opinions regarding their framing of
queer bodies and wearables. This framing covered more bodily concerns, such as which physical features and sensations are connected to queerness and where different “queer” emotional and mental sensations reside in queer bodies. Our participants also highlighted the different parts of queer anatomies that would use wearable devices, technological I/O, and biological I/O.

In exploring queer wearable ideation, we observed four recurring themes of participant designs. Participants designed wearables for expression or communication, the changing of queer bodies, managing queer health, and finding others in the community. Through reflection on their designs, we observed four high-level themes of queer wearable design considerations. Participants emphasized designing to support queer lived experiences (e.g., independence, safety), expression and visual presentation, queer bodies, and meaningful functionalities (e.g., user control, external device connectivity). Participants additionally shared different barriers and concerns they attributed to wearable usages such as device safety, abandonment concerns, and poor aesthetics.

In the next chapter, we explore a synthesized discussion of the findings from both phases of the overall study. We seek to enrich the current understanding of queer expression and semiotics within HCI while sharing design considerations and recommendations for wearable designers to create meaningful user experiences for queer users. Finally, we reflect on the application and future feasibility, of body mapping as a queer research method.
Chapter 5: Discussion

Through a series of 16 semi-structured interviews and 15 body mapping workshops, we explored the experiences, opinions, and aspirations for wearables as highlighted by a diverse representation of the queer community. Following our interviews, we observed three major themes: (1) wearable use and design, (2) queerness and expression, and (3) wearables and expression. As a result of conducting our body mapping workshops, we also recognized a recurrence of the theme of queerness and expression while noting discussions on the themes: (1) queer bodies and expression and (2) envisioning wearables for the queer community. Our two-phase study elicited rich insights into how to design for expression and wearable usage in a way that is meaningful and beneficial for the queer community. It similarly provided a deeper understanding into the role queer bodies play in expression, quality-of-life, and wearables.

Our findings exemplify the importance of authentic queer expression and how it affords queer individuals opportunities to experience heightened senses of comfort, euphoria, and pride while simultaneously promoting queer acceptance and acting as a social lubricant for those within the community [8,86,128]. Despite these benefits and a rapidly growing trend toward greater adoption of wearables [159], queer identity management research has primarily focused on the queer SNS user [5,21,34,58,97] and leaves a gap for similar exploration of physical emerging technology. On the other hand, to our knowledge, HCI research in expressive wearables has yet to provide an in-depth insight into queer lived experiences and opinions. While we can find examples of expression through wearables within the disabled community [114], Epp et al.’s [40] carried out their exploration of self-expression through social wearables in a university
setting, a lens they recognized as “historically male dominant and showing elitist structure” revealing unanticipated gender role conflicts. Our work addresses the gaps in both domains of HCI research, highlighting the potential for wearable design to account for authentic queer expression and thus the associated benefits that come with it.

Based on our findings, we leverage a deeper understanding of queer expressive practices and our participants’ mental models of wearables to discuss considerations for designing expressive wearables. Before exploring our design implications, however, we must reflect on how we leveraged our findings to expand on HCI’s understanding of queer identities and expressions. Finally, we reflect on our application of body mapping as a queer research activity.

5.1.1 On Understanding Queer Identities and Expression

5.1.1.1 Queerness and Fluidity

Our participants shared a variety of insights that provide greater understanding into queer lived experiences. One of the most prominent elements of queer lived experiences for our participants is fluidity. This aligns with the paradigm shift from sexuality and gender as rigid, uniform characteristics to complex experiences that exist along a personal, ever-changing spectrum [3,4,8]. Queer HCI has already placed several emphases on the importance of designing for queer fluidity in SNS [5,34,58,67]. With a growing potential of unique wearable applications such as gameplay [95], fashion [150], and group fitness [96], wearable designers must similarly consider and apply the evolutionary nature of queer identities and expression to ensure society does not further exclude the queer population.
We likewise want to emphasize that while our participants provided abundant insights regarding explicitly queer experiences, initial assumptions regarding queerness were shifted. This occurred when participants encouraged the consideration of queerness as a multifaceted lived experience influenced by other identities. Notable examples include the intersection of queerness and disability and how members of racialized communities uniquely practice, experience, and understand queerness [23,100]. Similar to Haimson et al.’s [59] observations through their exploration of user-generated technologies designed by trans people of colour, the queer design considerations our participants highlighted are thus likely also to benefit other intersecting marginalized communities (e.g., an exoskeleton to address physical labour for queer people would likely address physical inaccessibility barriers for disabled cisgender-heterosexual users).

5.1.1.2 Queer Aesthetics

Despite our assumptions of queer semiotics being a beneficial and efficient method of queer expression for wearables [13], we observed a rather substantial hesitancy to adopt queer semiotics. While certain participants highlighted the benefit of more well-known means of queer expression through items like pride flags, most shared an aversion to these techniques citing reasons such as being overused and aesthetically displeasing.

Building off Tuch et al.’s [136] observation of poor aesthetics leading to a perceived sense of diminished usability, it is thus vital to understand the design of queer semiotics and aesthetics to support queer user experiences.

What we thus observed was a reconceptualizing of what queer semiotics are. For many of our participants, the idea of symbols used to represent queerness did not have to be, and often were not, founded in standard queer aesthetics. What made a symbol or
metaphor “queer” were elements that showcased personal characteristics, interests, and experiences (e.g., wearing a Stephen Universe shirt to highlight a fondness for queer-coded media). In fact, for those who use them, we observed the adoption of queer semiotics centred on a perceived sense of utility instead of visual aesthetics. Queer semiotics was perceived as a tool to signal one’s queerness in the hopes of establishing things like safety. This coincides with Petersen et al.’s [53] framework of Pragmatist Aesthetics, aesthetics designed with consideration of their context and usage. We differ from Petersen et al. and other existing works in HCI aesthetic research [149,151], however, in offering explicitly queer perspectives on aesthetics that do not rely on binary conceptualizations of gender to inform finding interpretations.

5.1.2 Design Opportunities for Queer Wearables

Our motivation for exploring design considerations are rooted in a desire to prevent designers from contributing to what Sin et al. define as Digital Design Marginalization (DDM) [126]. In particular, we offer our discussions to prevent marginalization along the first stage of DDM, Design Decisions, by providing a rich insight into queer mental models and design considerations that wearable designers should leverage to prevent the “pushing away” of queer users through what Sin et al. refer to as digital “nonparticipation” and “non-adoption.” By utilizing our insights, wearable designers can follow Light’s [88] call to pursue “how to design so that we do as little as possible to hamper the evolution of variety,” ultimately preventing the further digital exclusion of queer users, participating in the dismantling of the social consequences and stigma of heteronormative trends in HCI [126].
We now offer initial design considerations for expressive wearables for queer users. We expand on some existing literature for wearable and queer design and offer new insights on topics such as leveraging functionality and expression.

5.1.2.1 Functionality versus Expression

When discussing the idea of wearables that incorporate queer expressivity, we note that our participants, while encouraging meaningful queer expression, largely emphasized the device’s functionality as being a priority over expression. We observed that queer expression is a matriculate combination of personal identities, experiences, and personality traits to create unique experiences. Thus when discussing designing functionality for expressive queer wearables, it is important to for designers to go beyond purely aesthetic output-centred devices and consider what Dagan et al. [29] refers to as the "interplay between sensing and actuating." Wearables should be designed to serve a distinct purpose that fits within the user’s lifestyle and needs, with queer expressivity designed as complementary to the device’s main functionalities (e.g., fitness wearable with customizable queer accessories). Expressive wearables designed for utility are a common endeavour in HCI [95,96] but have yet to be fully explored within explicitly queer perspectives. In continuation, we observed that wearables that can enhance an individual’s self-perceived queerness were those designed for quality-of-life (e.g., administering/monitoring hormones, preventing chest binder injuries). Our participants desired these over devices that simply serve to express queer aesthetics and thus suggest that improving one’s quality-of-life is in itself a form of queer expression, allowing individuals to feel like a better version of their queer self.
Additionally, we highlight that the queer community is extremely knowledgeable of devices that extended the standard, commercial conception of wearables, particularly wrist-based devices and headphones. Our participants indicated strong desires for wearables that creatively explore bodies through features like the chest and eyes. This suggestion is particularly beneficial as expressive devices could be designed to offer useful functionality while simultaneously providing expressive options in areas commonly used by the queer community, such as in the hair [115,141,150].

5.1.2.2 Customizability and Adaptability

When designing expressive wearables, designers must consider topics of customizability and adaptability. Epp et al. [40] made similar calls for the customization of functionality for self-expression through wearables to “allow people to create meaning through their practices and to avoid predefined labels.” We argue that this idea of customizability is particularly important for queer users, such as using pronoun combination lists that allow users to change them whenever they wish easily. Wearable designers should also address the need for meaning making in personal practices by incorporating a greater capacity for user-managed content. Our reconceptualization of queer semiotics is of particular importance in this case, as by creating and curating personal content, queer wearable users will be able to engage in more intimate and authentic expression with their devices and reap the psychological benefits of meaningful expression.

Likewise, wearable designers must allow for the customization of hardware components. Our participants highlighted qualities such as weight, shape, and size as offering avenues for connecting to their queerness, particularly as an assertion of gender expression. Argüello et al.’s [4] interchangeable prosthetics for Apple Face ID
exemplifies the benefit of creating customizable wearable hardware to express, explore, and upset ideas of queer identity. HCI designers should explore our findings to inform wearables that can offer similar engaging user experiences to interact with the multiplicity of queer identities and expressions.

Wearable designers must also create expressive wearables with adaptability in mind. Our participants’ emphasis on showcasing different aspects of their queerness to match different contexts is particularly noteworthy for how it mirrors existing literature in queer identity management’s recurring trends of selective visibility. This highlights how the importance of selective visibility queer SNS literature recommends for expression [34], disclosure [60], and discovery [56,58] can be applied to wearables. For instance, an expressive wearable device can have a toggleable discreet display setting that dims or hides all visibly queer elements with a single input that users can turn on later in a safe environment.

5.1.2.3 Accessibility

The accessibility of wearables proved to be a key concern for the queer community. There is a noteworthy overlap between the queer and disabled communities, as well as a substantial portion of the queer community reported struggling financially [46,100]. Devices and components’ usage should be easy to obtain and operate regardless of users lived experiences. Accessibility of acquisition and use of wearables is vital as, for many of our participants, actively expressing queerness can already be a laborious task.

We additionally stress the importance of making assistive technology expressive for disabled queer users. Profita et al. [114] found that expressive modifications of cochlear implants helped to create meaningful relationships between assistive technology
and the user. Our work expands on similar findings of authentic expression, offering such relationships with technology but from an explicitly queer perspective. We thus argue that building queer expression into assistive wearables would cater to queer disabled individuals and contribute to the “management of societal expectations,” as Profita et al. suggested. We do, however, suggest the need for deeper investigation into the specific intricacies of building queer expression into wearable assistive technologies through an exploration of the *Stigma and Social Weight* dimension of Deibel’s [32] heuristic model for assistive technology adoption.

5.1.2.4 Safety

When designing any device with the queer community in mind, it is essential to consider how it might affect the users’ safety. Blackstone et al. [12] and Simpson et al. [125] both found that commercial fitness wearables can negatively affect the user’s emotional and physical health by inadvertently promoting behaviours linked to eating disorders such as calorie counting and compensatory behaviours for fitness goals. This is particularly relevant for a group like the queer community as eating disorders have been observed to disproportionately affect queer individuals, especially queer women and gender-diverse individuals [71,94]. The queer community has also shared concerns about the negative mental health impacts wearables might pose when increasing a sense of over-connection between the user and their other devices. Wearable designers must consider the unique lived experiences and vulnerabilities of their potential users and do their best to anticipate and alleviate any negative emotional and physical harm from prolonged use.

Another safety concern for the queer community regarding wearable usage lies in data safety and privacy. Many queer individuals fear large corporations and unknown
entities harbouring their information due to different societal risks such as exclusion, job terminations, and physical violence [97,99]. As such, wearable designers designing for the queer community must ensure they are transparent with their data usage policies and, whenever possible, allow users to control how their data usage, stored, and disseminated. We additionally refer to Devito et al.’s [34] call for designers to ponder the evolutionary nature of their data safety practices. Whether in an SNS or wearable, data privacy policies for queer users must acknowledge and evolve alongside their users, just as their queerness and expression evolve.

5.1.3 **Body Mapping as a Queer Research Activity**

Our decision of exploring body mapping as a queer research activity proved to be an extremely fruitful endeavour. Our use of body mapping as a visual retelling of certain prompts differed from the standard use of body maps for exploring in-the-moment physical sensations [25,45,49,98]. We instead used body mapping as a sort of design fiction probe, exploring a direction akin to Noortman et al. [106] discussing technology-based future scenarios. This was particularly beneficial in supplementing the findings of our first phase, as our attempts at engaging in design ideation through an interview proved challenging for our participants and yielded little meaningful data. The speculative nature of our body mapping method, however, allows for more fruitful design ideation of expressive wearables not constrained by the availability of specific technologies and offer opportunities for critical conversations surrounding ethical expressive wearables and marginalized bodies [89,129].

The body mapping activity proved extremely useful in addressing R3 by not only shedding light on our understanding of queer bodies, but also encouraging the design of
future queer wearables. The body mapping activity provided in Appendix C was particularly beneficial in encouraging participation as several participants stated that they were removed from their queer expression enough to not be sure if they could meaningfully contribute. Initially expecting to receive a single design per participant, totalling in 15 designs, many participants were eager to design multiple queer wearables, totalling in 34 designs. This allowed for richer analysis of wearable design ideas and considerations. This is likely attributed to three participant commentaries on the body mapping activity proving to be a fun and therapeutic method of reflecting on one’s present and future selves.

Our motivation for pursuing a unique take on body mapping was grounded in Haimson et al.’s [59] work in designing trans technologies “To identify salient oppressive societal factors and ways technology design may help to address these.” Much like Haimson et al. our work not only aligns with Dombrowski et al.’s social justice design dimension of recognition [36], but offers a substantial methodological contribution. Most of our conversations focused on exclusively non-cisgender-heterosexual experiences, but we must acknowledge the numerous connections made with other communities. As such, we encourage HCI researchers to pursue using our methodology to gain similar understandings related to how wearable design can support quality of life for marginalized communities. Similarly, our work contributes to Spiel’s [129] call for further exploration of non-privileged bodies within HCI research. Aligning with how PB10 shared the sentiment of “Fuck ‘My body is a temple’”, we observed a connection to avoiding categorizing the body as a singular unit and rather an evolving set of multiple
bodies, something that is malleable and changeable over time at the individual’s discretion.

Building off Bain et al.’s [7] reflective framework, the lead researcher will now offer a personal reflection of their experience utilizing this body mapping methodology for the first time. For readability, the following paragraph will be told in the first person, using “I” about the lead researcher. I facilitated 15 one-on-one body mapping workshops with a diverse representation of the queer community. Despite initial hesitancy for participant engagement and feasible findings, I felt the sessions each elicited conversation and designs that provided useful insight in addressing our research questions while also offering the opportunity to critique my assumptions. While my experience as an HCI researcher allowed me to use my skills and knowledge in the first phase of the study, the body mapping activity was one I was completely new to. I believe, however, that this allowed me to enter the workshops with little to no bias as I let them run their course quite naturally, creating a stress-free environment for the participants. My lived experience as a queer man, however, did likely introduce some bias regarding what type of discussion I was expecting to have, particularly related to queer semiotics as they are something I engage with often. I believe this could have had a minor impact on my personal interpretations of certain pieces of data. Still, I was fortunate to have my analysis conducted with the guidance of a senior researcher with body mapping expertise.
Chapter 6: Conclusions

This thesis explored the design of wearables in the context of queer expression. Through 16 semi-structured interviews and 15 body mapping workshops, we explored the expressive experiences, understandings, and opinions of queer individuals with wearables. In this chapter, we offer conclusions and future research opportunities and limitations for this thesis.

6.1 Research Questions Revisited

To understand how wearables can support current expressive practices for the queer community, we posed the following research questions:

R1. How does the queer community practice the expression of their queerness
R2. How can wearables be designed to best support queer expression?
R3. How can body mapping as a research activity generate new knowledge regarding the experiences of queer expression and wearables?
R4. What types of future expressive queer wearables does the queer community envision?

We found five unique major themes that highlight the properties of queer expression and the design of wearables for queer users. In answering R1, we observed the queer community’s experiences with queer expression, demonstrating the complexity of the practice, noting different trends in how queerness expression in which a variety of desires, barriers, and external factors influences it.

Furthermore, through thoughtful discussion and body mapping, our participants shared a thorough knowledge of wearables that provided a rich perspective in answering
R2 and R4. We note design recommendations and queer wearable concepts prioritizing qualities such as functionality, customizability and adaptability, accessibility, and safety.

Regarding R3, we note our application of body mapping as an extremely useful method worth further replication. We presented a take on body mapping that offered participants a unique opportunity to effectively practise wearable design while personally reflecting on their lived experiences. We conclude by emphasizing the importance of future work to explore the prototyping of expressive queer wearables and the impact of carrying out the methodology with other marginalized communities.

6.2 Future Works and Limitations
We have gathered insights into queer expression and queer lived experiences, with further considerations and designs of wearables to support these experiences. The logical next step in our work is prototyping designs provided by our participants. While several designs reflect devices that are currently not technologically feasible, wearable research is investigating several similar devices and their potential to be implemented in the near future. Additionally, we encourage researchers to explore how similar devices could be used by other marginalized communities and applying the methodology for different groups could elicit unique ideas and considerations for wearables design.

While we are grateful for the rich findings and knowledge brought on by our work and participant contributions, we recognize the limitation of the participant population in our study. Regardless of the increased diversity of the participants of phase two, we acknowledge that only five participants across both phases were above the age of 35 and 93% of phase one participants identified as White. This unfortunately excluded perspective informed by different racial backgrounds and older queer community
members. Despite a relatively diverse gender representation across both study phases, we recognize the importance having a greater representation of trans*-identifying participants has on a study investigating the diversity of queer experiences. While we seek to provide a high-level insight into the needs and wants of the queer community as a whole, we also recognize how the presentation of the heat maps poses the risk of homogenizing the experiences of different queer individuals (e.g., cisgender and transgender men). It is for this reason that we further implore future work to conduct similar studies with more nuanced communities to gain an even richer insight into their experiences.

6.3 Conclusion

Our work provides an in-depth examination of queer expression and wearables and the impact meaningful queer wearables can offer to their users. Our study advances research on queer identity management by providing an insight into an emerging technology, wearables, that has yet to be thoroughly explored as a medium for queer expression. By leveraging the lessons from our participants’ first-hand accounts and envisioned designs, wearable designers can create devices that provide richer, personalized, and authentic user experiences for queer users.
Appendices

Appendix A  Ethical Clearance

CERTIFICATION OF INSTITUTIONAL ETHICS CLEARANCE

The Carleton University Research Ethics Board-8 (CUREB-8) has granted ethics clearance for the changes to protocol to research project described below and research may now proceed. CUREB-8 is constituted and operates in compliance with the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2).

Ethics Clearance ID: Project # 116259

Principal Investigator: Adrian Bolesnikov

Co-Investigator(s) (if applicable): Adrian Bolesnikov (Primary Investigator)
Karen Cochrane (Other)
Dr. Audrey Girouard (Research Supervisor)

Project Title: Wearable Identities: Understanding Wearables’ Potential for Supporting the Expression of Queer Identities

Funding Source:

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<th>Awards File No</th>
<th>Title</th>
<th>Status</th>
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<tr>
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<td>Design and Evaluation of Screen-less Deformable User Interfaces</td>
<td>Active Form</td>
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Effective: May 17, 2022  Expires: September 30, 2022

This certification is subject to the following conditions:

1. Clearance is granted only for the research and purposes described in the application.
2. Any modification to the approved research must be submitted to CUREB-8 via a Change to Protocol Form. All changes must be cleared prior to the continuance of the research.
3. An Annual Status Report for the renewal or closure of ethics clearance must be submitted and cleared by the renewal date listed above. Failure to submit the Annual Status Report will result in the closure of the file. If funding is associated, funds will be frozen.
4. During the course of the study, if you encounter an adverse event, material incidental finding, protocol deviation or other unanticipated problem, you must complete and submit a Report of Adverse Events and Unanticipated Problems Form.
5. It is the responsibility of the student to notify their supervisor of any adverse events, changes to their application, or requests to renew/close the protocol.
6. Failure to conduct the research in accordance with the principles of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans 2nd edition and the Carleton University Policies and Procedures for the Ethical Conduct of Research may result in the suspension or termination of the research project.

Special requirements for COVID-19:

If this study involves in-person research interactions with human participants, whether on- or off-campus, the following rules apply:

1. Upon receiving clearance from CUREB, please seek the approval of the relevant Dean for your research. Provide a copy of your CUREB clearance to the Dean for their records. See Principles and Procedures for On-campus Research at Carleton University and note that this document applies both to on- and off-campus research that involves human participants. Please contact your Dean’s Office for more information about obtaining their approval.

2. Provide a copy of the Dean’s approval to the Office of Research Ethics prior to starting any in-person research activities.

3. If the Dean’s approval requires any significant change(s) to any element of the study, you must notify the Office of Research Ethics of such change(s).

Upon reasonable request, it is the policy of CUREB, for cleared protocols, to release the name of the PI, the title of the project, and the date of clearance and any renewal(s).

Please email the Research Compliance Coordinators at ethics@carleton.ca if you have any questions.

CLEARED BY:          Date: May 17, 2022

Bernadette Campbell, PhD, Chair, CUREB-B

Kathryne Dupre, PhD, Co-Chair, CUREB-B
A.1 Consent Form for Interviews

Informed Consent Form

Name and Contact Information of Researchers:
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Project Title
Wearable Identities: Understanding Wearables’ Potential for Supporting the Expression of Queer Identities

Project Sponsor and Funder (if any)
This project is funded by NSERC

Carleton University Project Clearance
Clearance #: 116259 Date of Clearance: Sept 29, 2021

Invitation
You are invited to take part in a research project because you are an English-speaking adult who identifies as LGBTQ2IA+ or any other identities that fall outside of cisgender and/or heterosexual (hereinafter referred to as queer) and is interested in sharing their insight, experiences, and opinions on sexuality/gender identity expression and how wearable technology might support it. The information in this form is intended to help you understand what we are asking of you so that you can decide whether you agree to participate in this study. Your participation in this study is voluntary, and a decision not to participate will not be used against you in any way. As you read this form, and decide whether to participate, please ask all the questions you might have, take whatever time you need, and consult with others as you wish.

What is the purpose of the study?
The purpose of this study is to provide researchers with a better understanding into the intersection of queer identity expression and wearable technology. It will provide a detailed insight into the experiences of queer individuals when expressing their identities and how wearable technology could potentially be used to support expression and address any barriers to expression. It will also allow for potential future research opportunities for co-design workshops for solutions to pain points or proof-of-concept prototypes.

What will I be asked to do?
If you agree to take part in the study, we will ask you to:
• Participate in an individual online interview discussing queer identity, expression, and wearable technology.
• Meet for up to 1 hour using your preferred method of communication (e.g., Zoom, Google Meet, Phone)
• The interview will be recorded by note taking and using built-in recording technologies or a digital recorder for phone interviews.
• Transcription of interviews will be done using the artificial intelligence audio transcription software Trint. Should you decide to opt out of the use of Trint software for audio transcription, transcription of recordings will be done manually by the lead researcher.
• You will be asked during the interview to share any photos or videos of any items you use to express your queer identity with the lead researcher via e-mail. This is voluntary and you may choose to opt out of sharing any photos/videos. Should images of your items be suggested for use in a paper of the findings intended for publication, you will receive a follow-up form seeking your permission to use the image and how you choose to be identified alongside it (i.e., pseudonym vs. self-disclosure)
• You will be asked at the end of the interview for your interest in being contacted to participate in a future follow-up design workshop where you and other queer individuals will brainstorm ideas for wearable technologies that would support queer identity expression. This is voluntary and you may choose to opt out of being contacted in the future.

Risks and Inconveniences
We anticipate minimal risks to participating in this study. All questions asked will be to facilitate a discussion on queer identity and wearable technologies. Questions will not cover any sensitive material.

As environments and social settings vary per individual, there could pose some social risk to certain individuals should data be compromised, and a participant be outed as a member of the LGBTQ2IA+ community. We will treat your personal information as confidential, although absolute privacy cannot be guaranteed. Please see section “Confidentiality” for more information on the steps we will be implementing to protect your data and information.

Possible Benefits
You may not receive any direct benefit from your participation in this study. Your participation, however, may allow researchers to better understand how wearable technology might be used to support the expression of queer identities.

Compensation/Incentives
If you agree to take part in the study, you will be compensated for your participation in the study with a 20 CAD e-gift card of your choosing, with the default option being from Amazon.

No waiver of your rights
By signing this form, you are not waiving any rights or releasing the researchers from any liability.
Withdraw from the study

If you withdraw your consent during the course of the study, all information collected from you before your withdrawal will be discarded.

After the study, you may request that your data be removed from the study and deleted by notice given to the Principal Investigator (named above) before December 31st, 2021.

Confidentiality

We will remove all identifying information from the study data as soon as possible, which will be after the interview is conducted and the data is analyzed.

We will treat your personal information as confidential, although absolute privacy cannot be guaranteed. No information that discloses your identity will be released or published without your specific consent. Research records may be accessed by the Carleton University Research Ethics Board in order to ensure continuing ethics compliance.

The results of this study may be published or presented at an academic conference or meeting, but the data will be presented so that it will not be possible to identify any participants unless you give your express consent.

You will be assigned a code so that your identity will not be directly associated with the data you have provided. This code will be generated in the style of “P#” with the # increasing by one per subsequent interview starting with P1. Transcribed data, audio, interview notes and consent forms will be stored on Citrix ShareFile hosted by Carleton University secure servers and only accessible by the lead researcher and supervisor and all responses will be saved using pseudonyms (e.g., P1).

For transcription, audio recordings of the interviews will be uploaded to Trint for transcription using pseudonyms to ensure all information remains anonymous. This will be stored on Trint’s servers during transcription which uses AWS data centers in the US (Oregon, North California, North Virginia, Ohio.) Once interviews are transcribed and collected by the research team. Trint will be contacted to permanently delete all data. Trint is also fully certified to ISO 27001, PCI DSS compliant, and verified by SAM, UK Crown Commercial Service and Cyber Essentials. Further information regarding Trint’s data security such as data transfer and storage using HTTPS and encryption using AES 256 can be seen in their security information at trint.com/security.

We will password protect any research data that we store or transfer. In-session” data, such as the audio, video and chat transcript from the interview, will be stored locally on the researcher’s computer.

Data Retention

Your de-identified data will be retained for a period of 3 years and then securely destroyed.

New information during the study

In the event that any changes could affect your decision to continue participating in this study, you will be promptly informed.
Ethics review
This project was reviewed and cleared by the Carleton University Research Ethics Board B. If you have any ethical concerns with the study, please contact Carleton University Research Ethics Board (by email at ethics@carleton.ca).

Statement of consent – print and sign name
I voluntarily agree to participate in this study. ___Yes ___No
I agree to be contacted for follow up research (e.g., design workshops) ___Yes ___No
I agree to be audio recorded ___Yes ___No
(Note: Recordings are mandatory for participation.)

________________________
Signature of participant

________________________
Date

Research team member who interacted with the participant
I have explained the study to the participant and answered any and all of their questions. The participant appeared to understand and agree. I provided a copy of the consent form to the participant for their reference.

________________________
Signature of researcher

________________________
Date

A.2 Consent Form for Body Mapping Workshops
Informed Consent Form

Name and Contact Information of Researchers:
Adrian Bolesnikov, Carleton University, Human-Computer Interaction/Computer Science
Tel.: (506) 260-2992
Email: Adrian.Bolesnikov@carleton.ca

Supervisor and Contact Information:
Audrey Girouard, Carleton University, School of Information Technology
Email: Audrey.Girouard@carleton.ca

Project Title
Wearable Identities: Understanding Wearables’ Potential for Supporting the Expression of Queer Identities

Project Sponsor and Funder (if any)
This project is funded by NSERC

Carleton University Project Clearance
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Invitation
You are invited to take part in a research project because you are an English-speaking adult who identifies as LGBTQ2IA+ or any other identities that fall outside of cisgender and/or heterosexual (hereinafter referred to as queer) and is interested in sharing their insight, experiences, and opinions on sexuality/gender identity expression and how wearable technology might support it. The information in this form is intended to help you understand what we are asking of you so that you can decide whether you agree to participate in this study. Your participation in this study is voluntary, and a decision not to participate will not be used against you in any way. As you read this form, and decide whether to participate, please ask all the questions you might have, take whatever time you need, and consult with others as you wish.

What is the purpose of the study?
The purpose of this study is to provide researchers with a better understanding into the intersection of queer identity expression and wearable technology. It will provide a detailed insight into the experiences of queer individuals when expressing their identities and how wearable technology could potentially be used to support expression and address any barriers to expression. It will also allow for potential future research opportunities for co-design workshops for solutions to pain points or proof-of-concept prototypes.

What will I be asked to do?
If you agree to take part in the study, we will ask you to:
• Participate in an individual online body mapping workshop discussing the relationship between the queer body and how wearable technology can better support queer expression. This will be done through the sketching current expressive practices and designing future wearable technologies.

• Meet for up to 1 hour using your preferred method of communication (e.g., Zoom, Google Meet)

• The workshop will be recorded by note taking and using built-in recording technologies.

• Transcription of workshop audio will be done using the artificial intelligence audio transcription software Trint. Should you decide to opt out of the use of Trint software for audio transcription, transcription of recordings will be done manually by the lead researcher.

• You will be asked at the end of the workshop to share photos or videos of the body maps you create with the lead researcher via e-mail. Should images of your items be suggested for use in a paper of the findings intended for publication, you will receive a follow-up form seeking your permission to use the image and how you choose to be identified alongside it (i.e., pseudonym vs. self-disclosure)

Risks and Inconveniences

We anticipate minimal risks to participating in this study. All questions asked will be to facilitate a discussion on queer identity and wearable technologies. Discussions will not cover any sensitive material but we recognize the potential difficulty of discussing one’s body and will provide appropriate resources to participants immediately after the session should they have found the session emotionally upsetting.

As environments and social settings vary per individual, there could pose some social risk to certain individuals should data be compromised, and a participant be outed as a member of the LGBTQ2IA+ community. We will treat your personal information as confidential, although absolute privacy cannot be guaranteed. Please see section “Confidentiality” for more information on the steps we will be implementing to protect your data and information.

Possible Benefits

You may not receive any direct benefit from your participation in this study. Your participation, however, may allow researchers to better understand how wearable technology might be used to support the expression of queer identities.

Compensation/Incentives

If you agree to take part in the study, you will be compensated for your participation in the study with a 20 CAD e-gift card of your choosing, with the default option being from Amazon.

No waiver of your rights

By signing this form, you are not waiving any rights or releasing the researchers from any liability.

Withdrawing from the study

If you withdraw your consent during the course of the study, all information collected from you before your withdrawal will be discarded.
After the study, you may request that your data be removed from the study and deleted by notice given to the Principal Investigator (named above) before July 1st, 2022.

**Confidentiality**

We will remove all identifying information from the study data as soon as possible, which will be after the session is conducted and the data is analyzed.

We will treat your personal information as confidential, although absolute privacy cannot be guaranteed. No information that discloses your identity will be released or published without your specific consent. Research records may be accessed by the Carleton University Research Ethics Board in order to ensure continuing ethics compliance.

The results of this study may be published or presented at an academic conference or meeting, but the data will be presented so that it will not be possible to identify any participants unless you give your express consent.

You will be assigned a code so that your identity will not be directly associated with the data you have provided. This code will be generated in the style of “P#” with the # increasing by one per subsequent workshop session starting with P1. Transcribed data, audio, video, session notes, body maps and consent forms will be stored on Citrix ShareFile hosted by Carleton University secure servers and only accessible by the lead researcher and supervisor and all responses will be saved using pseudonyms (e.g., P1).

For transcription, audio recordings of the workshop session will be uploaded to Trint for transcription using pseudonyms to ensure all information remains anonymous. This will be stored on Trint’s servers during transcription which uses AWS data centers in the US (Oregon, North California, North Virginia, Ohio.) Once sessions are transcribed and collected by the research team. Trint will be contacted to permanently delete all data. Trint is also fully certified to ISO 27001, PCI DSS compliant, and verified by SAM, UK Crown Commercial Service and Cyber Essentials. Further information regarding Trint’s data security such as data transfer and storage using HTTPS and encryption using AES 256 can be seen in their security information at trint.com/security.

We will password protect any research data that we store or transfer. In-session” data, such as the audio, video and chat transcript from the workshop session, will be stored locally on the researcher’s computer.

**Data Retention**

Your de-identified data will be retained for a period of 3 years and then securely destroyed.

**New information during the study**

In the event that any changes could affect your decision to continue participating in this study, you will be promptly informed.

**Ethics review**

This project was reviewed and cleared by the Carleton University Research Ethics Board B. If you have any ethical concerns with the study, please contact Carleton University Research Ethics Board (by email at ethics@carleton.ca).
Appendix B  Interview Study Script

Statement of consent – print and sign name
I voluntarily agree to participate in this study. ___Yes   ___No
I agree to be audio and video recorded ___Yes   ___No
(Note: Recordings are mandatory for participation.)

______________________________________________
Signature of participant               Date

Research team member who interacted with the participant
I have explained the study to the participant and answered any and all of their questions. The participant appeared to understand and agree. I provided a copy of the consent form to the participant for their reference.

______________________________________________
Signature of researcher               Date
Appendix E

Interview Questions

Demographics:
1. What is your age?
2. What gender(s), if any, do you identify with?
3. Do you identify as transgender or have a transgender history?
4. What is your sexual orientation?
5. How would you describe your race/ethnicity?

Identities Expression:
6. In what ways do you express your identities?
   [If participant seems confused/requires examples: “If you need some examples, common ways could include decorations (e.g., flags), clothing, accessories (e.g., pins, buttons)”]
7. [If discussed using any specific items for expression] Would you be willing to share a photo/video of [ITEM USED FOR IDENTITY EXPRESSION] via e-mail as examples of items used to display queer identities? [If answered yes] Great, thank you! Please make sure to only include photos of the items and be aware of showing any visibly identifying features such as your face, tattoos, or any other marks or features as we may ask for your permission to use the image in a future publication.
8. [If answered anything but “I do not” to Q6] Why do you choose to express your identities in those ways?
9. [If answered anything but “I do not” to Q6] Describe how you typically feel when doing so.
10. [If answered anything but “I do not” to Q6] In what was has/do your identities expressions ever change over time/place?
11. [If answered “I do not” to Q6] Why do you choose to not express your identities?
12. What are some barriers that prevent you from expressing your identities?
13. What are some challenges you face in the moment while expressing your identities?
14. How do you perceive others’ identities?
15. What challenges arise from understanding others’ identities?

Wearable Use:
16. When you hear the term “wearable technology,” what kind of devices come to mind?
17. Do you use any wearable devices?
   [If participant requires examples: “Some common examples of wearable devices include smart watches like the Apple Watch and Fitbit, Google Glass or gaming wearables like Virtual Reality headsets”]
   [If participant requires a definition: “Wearable devices are commonly known to be devices and electronics that are integrated into clothing and other accessories that can be worn comfortably on the body. Wearable devices are made to incorporate devices and computers seamlessly into people’s every day lives”]
18. [If answered “Yes” to Q15] Which ones?
19. [If answered “Yes” to Q15] Why do you use those devices?
20. [If answered “Yes” to Q15] Aside from their intended purposes, is there any additional features you make use of on those devices?
21. [If answered “No/Not Anymore” to Q15] Are there any reasons why you choose not to no longer use wearable devices?
22. What makes a wearable device “worthwhile” to you?
23. What barriers/challenges might prevent you from using certain wearable devices?

**Digital/Wearable Identities Expression:**

24. Do any digital devices you own reflect your identities in any way?

25. [If answered “Yes” to Q21] What modifications/features help to do so? (e.g., Apple Watch with a special background, phone case with a special message on it)

26. [If answered “No” to Q21] What factors influenced your decisions to not express your identities through your devices?

27. In what ways do your digital personas (e.g., social media, online video games) reflect your queer identities?

28. Imagine a wearable device that could help with expressing your identities:
   a. How would it work?
   b. Would it be used just for expression, or would that be an additional feature?
   c. What would you like it look like?
   d. What is the context you would use it in? (E.g., where, when)
   e. What special considerations should be taken for it? (e.g., safety, accessibility, volume)
   f. How would you describe someone’s experience with it?

[Ask participant if they have any comments/thoughts they would like to share]

[Remind participant to share recruitment material with any contacts should they wish]

[Thank participant and remind them about compensation]
Appendix E

Interview Questions

Demographics:
1. What is your age?
2. What gender(s), if any, do you identify with?
3. Do you identify as transgender or have a transgender history?
4. What is your sexual orientation?
5. How would you describe your race/ethnicity?

Stream of Consciousness Activity:
1. “Alright, to get us started and get some of the ideas flowing, we’ll start of with a stream of consciousness activity. I’ll set a timer for 5 minutes, in those 5 minutes write about how you express your queerness and the different aspects of it. No rules, no judgement, no grammar, just write whatever comes to mind!

Body Mapping Prep:
1. Remind participants that they will need a pencil, two pieces of blank paper, and colouring pencils/crayons/markers
2. Ask participant to draw 2 body outlines on each piece of paper (not stick figures).
   a. Remind the participant that they can be done in any shape/colour they are comfortable with
   b. Remind the participant that outlines should be big enough to be able to clearly add colour and drawings within them.
3. Ask participant to label underneath each outline with either “Front” or “Back” alternating
   a. “This should leave you with 2 pairs of body outlines. Each with one Front and one Back outline”
4. Ask participant to write the word “Current” over the first pair of outlines.
5. Ask participant to write the word “Future” over the second pair of outlines.

Body Mapping Exercise:
1. Inform participant that we will be running through a series of sketching prompts, but they are free to edit and change the sketches as they wish.
2. “Considering your life up until now, think about the different ways your body and what you wore reflected, expressed, and connected to your queerness. This could be things you wore on different parts of your body, the way you moved your body or physical aspects themselves. Some things to consider could be:
   a. The ways it may have evolved over time.
   b. Barriers you may have faced.
   c. Reasons you chose to dress/groom/move in a certain way.
   d. How those things made you feel.”
3. “Using colours and shapes/drawings, sketch your thoughts/feelings/ideas on the ‘Present’ outlines. If there are things you’d like to draw that aren’t on your body, feel free to add it around your body as well!”
4. “Now thinking about the future, design a wearable device that could help with expressing your identities. Be as creative as you wish, imagine this device exists within a utopian society if you’d like. Here are some things to consider:
   a. How would it work? Would it be used just for expression or would that be an additional feature?
   b. What would it look like? Where on your body would it go?
   c. How would you describe your experience with it?
   d. Are there any special considerations that should be taken for it? (e.g., safety, accessibility)
5. “Using colours and shapes/drawings, sketch your thoughts/feelings/ideas about the device on the ‘Future’ outlines. If there are things you’d like to draw that aren’t on your body, feel free to add it around your body as well!”
6. “Now, feel free to reflect on your body maps and add words to them to help describe certain aspects”

Post Body Mapping:
1. Ask participant to discuss each pair of body outlines.
   a. If participant mentions a concept, ask them how they might decide to draw it on the body map
   b. Ask participant to describe what certain colours/symbols represent (and to add labels when necessary)

Directed Questions Post-Workshop:
1. Comparing your current expression and the device you sketched, what’s the relationship between the two? Is the device an added layer to current expression or is it a brand-new element?
2. How do queer symbols and metaphors play a role in the current expression versus this ideal wearable?
3. What current barriers would this future device address? What challenges might it introduce?

[Ask participant if they have any comments/thoughts they would like to share]

[Remind participant to share recruitment material with any contacts should they wish]

[Thank participant and remind them about compensation]
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