Design sprints for assistive technology; a discussion advocating co-creation between design, lived experience and occupational therapy

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The World Health Organisation (WHO) see access to appropriate Assistive Technology (AT) as a human right. However, only one in ten people can access AT. Increasingly, we are seeing collaborative design practice within AT, though it is far from normalised in practice. To explore the potential for collaborative design within AT, we held two design sprints with People With Lived Experience of Disability (PWLED), designers and occupational therapists. We then conducted focus groups to understand what participants learned in this process and the potential opportunities and challenges in implementing collaborative design practices in the current environment. These focus groups were then analysed using thematic analysis. While all participants found the experience beneficial overall, there was an underlying current of the potential impact for PWLED. Many aspects of collaborative design, such as this process’s empathetic, iterative, interdisciplinary, and holistic nature, were evident and empowered the groups and PWLED to engage meaningfully. This led to a discussion of the need for empowerment and validation for PWLED and the potential for design practice to support social change for human rights within AT. At the same time, there are significant barriers and challenges to design practice within this space, as noted in both the literature and design sprints. This research reinforces the potential of design practice in this space and the need to start a dialogue demonstrating the value of design practice within the health and AT context for systemic change.

Keywords: collaborative design; assistive technology; social innovation; interdisciplinary

1 Introduction

1.1 Background
Globally, approximately 16% of the population can be classified as Persons With Lived Experience of Disabilities (PWLED); with a rapidly ageing society and earlier onset of chronic conditions, this figure is predicted to rise dramatically (Brocklehurst et al., 2018; WorldHealthOrganization, 2021). Subsequently, growing concerns exist about how this will impact already limited health and disability
support systems (Docherty, 2017; WorldHealthOrganization, 2022; Yang & Sung, 2016). Health issues are an acknowledged ‘wicked problem’ within both design and health literature (Periyakoil, 2007; Raisio, 2009), and consequently, we are seeing an increasing interest in how design methodologies may be implemented within this space (Bazzano et al., 2017; Holeman & Kane, 2020). Within the World Health Organization’s (WHO) Global Report on Assistive Technology (2022), there is a concern about how PWLEDs cannot engage in meaningful activities due to issues around access to suitable assistive technologies (AT)—leading to issues of access and abandonment (Federici & Borsci, 2016; Ravneberg, 2012; WorldHealthOrganization, 2022). They exemplify this through multiple case studies where individuals engage in different meaningful pursuits, demonstrating how specific AT can support this and the potential negative impact on the individual if unable to access AT that meets their needs (WorldHealthOrganization, 2022).

1.2 Opportunity

Whilst limited, design research explores this space and examines the potential of collaborative methods (Aflatoony & Jin Lee, 2020; Hamidi et al., 2018; Quintero, 2022). Occupational therapists frequently assess, prescribe and work in AT (Cruz et al., 2016). There is increasing literature on design and AT in this space, but it remains limited (Hobbs et al., 2019; Jordan, 2020; Pousada García et al., 2021).

The space surrounding AT is inherently complex and multifaceted, with ongoing issues denying PWLED the opportunities to co-create the systems surrounding them (Nakarada-Kordic et al., 2021; WorldHealthOrganization, 2022). Consequently, there is an opportunity for collaborative design practices to facilitate action directly impacting human rights and social justice (Buchanan, 2001; Holeman & Kane, 2020; Jones, 2016). It is this space that this paper intends to explore through a case study that employed a collaborative design process focusing on AT.

1.3 Research question

A design sprint incorporating PWLED, OTs and designers was proposed to explore further the potential opportunities presented within the design community in AT. Within this design sprint, two areas were explored:

1. What are the benefits and potential pitfalls in utilising a collaborative design methodology with PWLED, designers and OTs?
2. What are the learnings for stakeholders in participating in this process, and what does this mean going forward?

To investigate this, we outline the methodology used within the design sprint. We will then elaborate on the subsequent results and participants’ findings before discussing what this may mean for design practice.

2 Methods

2.1 Choice of collaborative design method and mixed methodology

The authors acknowledge that design practitioners have commenced exploring collaborative design processes within AT (Aflatoony & Jin Lee, 2020; De Couvreur et al., 2013; Hamidi et al., 2018; Quintero, 2022). However, there is still latitude to investigate best practices within this space. In undertaking
this investigation, a design sprint was implemented using the Design Council’s Double Diamond framework (2015). Acknowledging previous studies indicating the need for a structured yet reflexive approach (Turesson et al., 2022; Villa-Garcia et al., 2022).

A mixed methodology framework was used to understand the participants’ experience (Cramer-Petersen et al., 2019), whereby qualitative data was collected during the design sprint, and quantitative data was collected using a pre and post-design sprint survey undertaken online.

2.2 Procedure

The design sprints’ focus was to understand better how collaborative methods could be utilised in AT and how to support PWLED, designers and OTs working together. Subsequently, each sprint was planned to have a maximum of three groups, each with a PWLED, design professional, and OT collaborating. As accessibility was a significant factor noted in both the literature (Heerings et al., 2022; Lynn et al., 2016; Macdonald et al., 2022) and within the piloting of this project, two design sprints ran with modified formats to allow for disparate needs. This included: a single-day sprint that ran over six hours with multiple short breaks and three two-hour sprints over five days (Figure 1). This allowed for busy schedules, symptom management, and the care needs of participants and family members, creating a more equitable process and allowing for different access requirements. Another issue was the ability to participate in person, as interested individuals may have issues relating to mobility or distance. To address this, the sprints were managed in various formats, with teams working entirely online, hybrid (online and face-to-face) or groups working entirely in person, ensuring equity for all.

![Figure 1: Design Sprint overview, adapted from Design Council (2015) Double Diamond and using tools from IDEO’s Design Kit (IDEO.org, 2015)](image)

Before participating, each PWLED participant was asked to bring an AT issue that impacted their life to the design sprint. They were placed in a group with a designer and OT. The researchers then introduced collaborative design and the Double Diamond framework, explaining the process before each work stage. While the designers of each group were encouraged to use their unique skill sets, the researchers suggested potential tools from IDEO’s Design Kit (IDEO.org, 2015) that were appropriate for each stage (Figure 1). All participants were supplied with worksheets detailing these tools and links to the IDEO website. The differentiation in steps of the process allowed for a natural break for groups to check in with one another, get feedback and prepare for the next step. Throughout
the procedures, researchers were available to assist the groups. All participants were requested to complete an online survey before and after the design sprint to gauge any changes in attitudes towards collaborative design practices in this space (Phillips et al., 2013).

2.3 Ethics
Ethics for this research were obtained through Swinburne University Human Research Ethics Committee (SUHREC) on 18 August 2022 (Ref: 20226569-10633). After piloting the procedure, amendments were recommended by PWLED. These amendments were then acted upon, and SUHREC accepted the modified approach on 22 October 2022.

2.4 Participants and recruitment
This research used convenience and snowball sampling methods to recruit participants (Gill, 2020; Sadler et al., 2010). Per the procedure, the populations of interest were PWLED who used AT, designers, and OTs. No participants needed to have had experience in collaborative design practices within AT.

The recruitment of participants was completed in two stages. Initially, participants from previous studies (including PWLED, OTs, and designers) who had indicated interest in further research were contacted via email, with the ability to feedback on the proposed methods, increasing their agency within the process. Once suggested amendments were made, researchers advertised for further participants through social media (special interest Facebook and Reddit groups, and special interest groups and general posts via LinkedIn). The researchers then advertised through professional organisations: Occupational Therapy Australia, the Australian Rehabilitation & Assistive Technology Association, and the Design Institute of Australia. The inclusion criteria for PWLED included that the participant must be 18 years or above and use AT daily. The inclusion criteria for designers and OTs were that they must be currently practising within their field. All participants had to give informed consent, be fluent in English, and participate in all aspects of the design sprint at the Swinburne University Hawthorn Campus or online using teleconferencing software (Figure 2). PWLED were renumerated for their participation, acknowledging their expertise within AT (Layton et al., 2022; Mankoff et al., 2010), aligning with Australian policies (Australian Government, 2019). While this policy is specific to mental health, the issues are transferable to PWLED within the broader context and, subsequently, this research.

Figure 2. Group discussion in a hybrid format, faces blurred for privacy (author generated).
2.5 Data collection
Researchers took observation notes throughout both design sprints, which were then discussed at the end of each session. While recorded notes from these discussions became part of the analysis, data was collected primarily from a presentation conducted at the end of each design sprint. The presentations commenced with each group demonstrating their findings per the procedure and in line with the last step of the double diamond process (DesignCouncil, 2015). This facilitated conversations regarding each group’s learnings during this process, how they intended to use them going forward, and the role of collaborative design methods within AT and disabilities. These presentations were recorded and transcribed for analysis.

Additionally, the authors developed and piloted a pre/post questionnaire based on work by Wagenfeld and Amiri (2017). All questionnaires were made available online through Qualtrics software (Qualtrics, 2005). This questionnaire was used to establish if participants had previously had the opportunity to engage in collaborative design practices, feelings towards interdisciplinary collaboration, and personal responses to collaborative design methods (comfort, enjoyment, productivity).

2.6 Data analysis
Qualitative data analysis consisted of reflexive thematic analysis of focus group transcripts and transcribed observations of the researcher’s discussion during the design sprints, following the steps outlined by Braun and Clark (2006). A theoretical and semantic approach was agreed upon prior to analysis, as it was congruent with previous decisions around research questions, procedures, and methodologies (Braun & Clarke, 2006, 2019, 2021). All transcriptions were coded and managed in NVIVO for Mac version 12.6.1 (Ltd., 2020).

All survey data was downloaded from Qualtrics to a central computer and reviewed in SPSS (IBM Corp., 2021). Descriptive data analysis only was undertaken, as the sample size was too small for meaningful pre and post-test comparison (Bolboacă et al., 2011; De Winter, 2019; Shieh, 2020).

3 Results
3.1 Participants
There was a broad scope of participants in both design sprints. The first sprint, held over several days, consisted of two groups and six participants. The second sprint consisted of three groups; however, one group consisted of a PWLED and designer, as the OT participant, dropped out unexpectedly. Researchers with a background in OT supported this group (researchers were not included in the final demographics or data collection due to potential bias). All participants had been working within their professional space for a significant period, with a broad scope of specialisations within disciplines, and the hybrid design sprints allowed participants from different cultural contexts to participate (Table 1). An unexpected factor was the crossover within disciplines. Among the OTs, one was furthering their education in user experience design in preparation for changing careers, and two PWLEDs had OT backgrounds. All PWLEDs had worked within healthcare in some way.

Table 1. Participant demographics.
### Participant Details

<table>
<thead>
<tr>
<th>Participant</th>
<th>Location</th>
<th>Gender</th>
<th>Age</th>
<th>Time in Professions (years)</th>
<th>Specialisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWLEG1</td>
<td>Australia</td>
<td>Female</td>
<td>41-45</td>
<td>10-15</td>
<td>Occupational Therapy (neurological rehabilitation)</td>
</tr>
<tr>
<td>DesignerG1</td>
<td>US</td>
<td>Female</td>
<td>36-40</td>
<td>1-5</td>
<td>UX design</td>
</tr>
<tr>
<td>OTG1</td>
<td>US</td>
<td>Female</td>
<td>31-35</td>
<td>6-10</td>
<td>Neurological rehabilitation</td>
</tr>
<tr>
<td>PWLEDG2</td>
<td>Australia</td>
<td>Female</td>
<td>46-50</td>
<td>20+</td>
<td>Remote area nursing</td>
</tr>
<tr>
<td>DesignerG2</td>
<td>US</td>
<td>Male</td>
<td>36-40</td>
<td>10-15</td>
<td>Product design</td>
</tr>
<tr>
<td>OTG2</td>
<td>US</td>
<td>Male</td>
<td>31-35</td>
<td>10-15</td>
<td>Older adult and end-of-life care</td>
</tr>
<tr>
<td>PWLEDG3</td>
<td>Australia</td>
<td>Female</td>
<td>41-45</td>
<td>10-15</td>
<td>Occupational therapy</td>
</tr>
<tr>
<td>DesignerG3</td>
<td>US</td>
<td>Female</td>
<td>36-40</td>
<td>6-10</td>
<td>UX and service design</td>
</tr>
<tr>
<td>PWLEDG4</td>
<td>Australia</td>
<td>Male</td>
<td>61-65</td>
<td>20+</td>
<td>Ergonomics and AT development</td>
</tr>
<tr>
<td>DesignerG4</td>
<td>Australia</td>
<td>Male</td>
<td>41-45</td>
<td>6-10</td>
<td>Service, product and UX design</td>
</tr>
<tr>
<td>OTG4</td>
<td>Australia</td>
<td>Female</td>
<td>36-40</td>
<td>10-15</td>
<td>Disabilities and community therapy</td>
</tr>
<tr>
<td>PWLEDG5</td>
<td>Australia</td>
<td>Male</td>
<td>66-70</td>
<td>20+</td>
<td>Pharmaceutical marketing</td>
</tr>
<tr>
<td>DesignerG5</td>
<td>Australia</td>
<td>Female</td>
<td>41-45</td>
<td>10-15</td>
<td>Graphic Design</td>
</tr>
<tr>
<td>OTG5</td>
<td>Australia</td>
<td>Female</td>
<td>51-55</td>
<td>15-20</td>
<td>Spinal cord injuries</td>
</tr>
</tbody>
</table>

### 3.2 Survey data analysis

Thirteen of the fourteen participants responded to both surveys (five PWLED, four designers and four OTs) and were included for analysis. Before the design sprint, 7.7% of this sample had not encountered collaborative design practices in this context, and 77% indicated they had used them within their work. However, there was a broader spread of responses regarding the frequency of engagement in both collaborative design methods and the design or modification of AT, with only 15.38% of the entire sample participating in collaborative design once a month or more and only 7.69% working with AT modification or design once a month or more (Figure 3).

![Figure 3. Opportunities and frequency to participate in collaborative design and design of AT.](image-url)
Before the design sprint, the sample agreed that while both designers and OTs had roles to play in the design of AT, some felt either profession was required only some of the time (30.77% for designers and 46.15% for OTs). Notably, 92.31% of the sample felt PWLED always had a role. The sample agreed that collaborative practice was potentially beneficial in this space, but 23.08% felt this was only moderate. While the entire sample felt that this practice would be productive, there was a slight spread in responses to overall comfort, enjoyment in participating, and confidence in communication (Figure 4).

![Pre-Sprint feelings about roles of participants and benefits of collaborative design](image)

![Pre-Sprint feelings about interdisciplinary practice](image)

*Figure 4. Pre-sprint questionnaire results.*
After the design sprint, all participants agreed that PWLED, designers and OTs were required to design AT. However, 15.38% indicated that designers and OTs were required some of the time, and 7.69% of the sample indicated that PWLEDs were required some of the time. The entire sample agreed that there was a potential benefit in this practice in the space of AT, with 92.31% indicating there would be a significant potential benefit. All questions responding to feelings around interdisciplinary practice had a narrow and generally positive spread. All participants noted they felt this space would be productive, and they would be very comfortable or already work in interdisciplinary practice in this space. The majority noted they would be moderately to very confident in their role, and only 7.69% of the sample indicated that they would expect the experience to be neither enjoyable nor unenjoyable overall (Figure 5).

<table>
<thead>
<tr>
<th>Role of PWLED in design of AT</th>
<th>No, (out of the scope)</th>
<th>Yes, only exceptional cases</th>
<th>Yes, all the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role of Designer in design of AT</td>
<td>No, (inadequate resources)</td>
<td>Yes, some of the time</td>
<td>Yes, all the time</td>
</tr>
<tr>
<td>Role of Occupational therapist in design of AT</td>
<td>No, (out of the scope)</td>
<td>Yes, only exceptional cases</td>
<td>Yes, all the time</td>
</tr>
<tr>
<td>Would be benefit from collaboration in the area of AT?</td>
<td>Yes, but only a very small benefit</td>
<td>Yes, a significant benefit</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 5. Post-sprint questionnaire results.**
3.3 Identified issues and subsequent results

While each group worked on an individual issue brought about by the PWLED, there was a crossover in the issues raised and subsequent solutions (Table 2).

Though each PWLED was unique, everyone brought issues related to their ability to access their surrounding communities—and the daily challenges faced by this—at a systemic level. These issues are congruent with the literature, where community access and systemic issues are significant factors in the lives of PWLEDs (Federici & Borsci, 2016; McDonald et al., 2015). These issues fall within the context of ‘wicked problems’, i.e. highly complex, systemic, and with no specific solution, reinforcing the potential role of design processes within this space (Blackman et al., 2006; Rittel & Webber, 1973).

The similarities within the identified issues prompted the focus groups to explore these issues faced by the PWLED. Subsequently, there was discussion about how participants responded to the collaborative process, their challenges, outcomes, and learnings, which will now be discussed.

Table 2. Issues and potential solutions by group.

<table>
<thead>
<tr>
<th>Group (days)</th>
<th>Issue for resolution</th>
<th>Potential solution space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Communication in busy environments</td>
<td>Use of paired applications on mobile devices and smartwatch to communicate</td>
</tr>
<tr>
<td>Group 2</td>
<td>Community access and mobility</td>
<td>Use of mobile application to alert the PWLED to potential hazards, and the need for systemic changes (not at final product due to complexity)</td>
</tr>
<tr>
<td>Group 3</td>
<td>Access to air travel</td>
<td>System re-design for booking of air travel (not at final product due to complexity)</td>
</tr>
<tr>
<td>Group 4</td>
<td>Access to air travel</td>
<td>“Car to Champagne” systems approach to re-design of air travel with levitating chairs</td>
</tr>
<tr>
<td>Group 5</td>
<td>Access to parking</td>
<td>Smart signs, system design of disability parking with incentives for enforcement and flexible parking spaces</td>
</tr>
</tbody>
</table>

3.4 Processes

While this design sprint was rapid and developed from several collaborative design principles, it maintained vital participatory design elements. Throughout the focus groups, participants reflected on the process, where themes fell into critical areas of collaborative design, as the process encouraged holistic, empathetic, iterative, and interdisciplinary practice.

3.4.1 Holistic

A holistic practice was crucial in all processes, as each identified issue was connected to community access. All groups noted how the environment, social systems and norms played a part in the issues faced by the PWLED and required consideration of potential outcomes. While increasing the complexity of each issue, the holistic practice allowed all participants to work together, pooling knowledge and resources. Accordingly, the outcomes of each group reflected this, where many focused on a systems approach while navigating this process.

3.4.2 Empathetic communication

While not explicitly discussed, the implications of empathetic practice were highly apparent and essential in the procedures. Within this context, empathetic communication allowed for greater empowerment of the PWLED and allowed for open discussions within areas that may be taboo. For
example, one group discussed issues in the communication of bodily autonomy around wheelchairs. DesignerG4 noted their learning when considering the implication of a broken (or forgotten) wheelchair;

“It's like if I left your legs behind, how would you feel? For somebody who doesn't live in the context, that's me. I would not think of the wheelchair (in that way)“.

This led to discussions of difficulties communicating needs, particularly around PWLED and policy. The empathetic process allowed the OTs to re-engage in person-centred care and for difficult discussions between PWLEDs and how their input is valued at a societal level. These conversations demonstrated how empathy within the design process allowed for efficient and effective communication, where all team members felt empowered to be curious about one another. This open curiosity allowed for greater empathy between participants leading to more significant learning and effective outcomes.

3.4.3 Iterative
The rapid design sprint process may have encouraged participants to prematurely jump to a solutions space. However, there was notable iteration in all group processes, and several groups noted that encouragement to use a more iterative approach ensured participants paid attention to the complexity of the issues and feedback from the PWLED. For example, one participant noted;

I think that a challenge was that, right off the bat, (we) started thinking about solutions, which I think we naturally tend to do. And then we had to go back and forth. Here are some great ideas for a solution. Oh, wait, we have to back up because we need to understand the situation ... So, (we then) defined the problem more, but then we would just iterate and refine, and that ultimately got us to this solution” -OTG1

Subsequently, several groups noted that the input of the PWLED was crucial to guiding the outcome and encouraging iteration and problem-solving approaches. This iterative approach was closely linked to the need for interdisciplinary practice.

3.4.4 Interdisciplinary
Interdisciplinary practice was another essential theme identified in this space. While participants came from varied backgrounds and may not have been involved in collaborative design with PWLED and AT prior to participating, each participant was prepared to work in an interdisciplinary manner. For example, OTG1 noted;

“I felt it was helpful to have multiple perspectives. I think that (PWLEDG1) had all this great knowledge about their exact situation, and then I had the lens of the activity analysis. I think (DesignerG1) did a great job of thinking about the user experience aspect of it, what will each interaction look like. So, I think that we had this cool, coming together, of really figuring out what the situation looked like, where the breakdown was, and creating the solution around that.”

Accordingly, while participants were all highly skilled in their fields, they needed to collaborate as equals. Consequently, there was consensus that without interdisciplinary collaboration, the outcomes would never have been resolved as effectively as they had with opportunities for collaboration and communication.
3.5 Challenges
While participants noted they enjoyed the process and saw the potential benefit, there were discussions of both challenges experienced within this design sprint and potential barriers to implementing collaborative design processes within the community. These issues generally fell into themes of resourcing, communication, and the complexity of the population, process, and surrounding systems.

3.5.1 Resource challenges
Both within the design sprint process—and considering potential barriers to practice—the issues surrounding time, cost, perceived value, and resourcing were frequent topics of conversation. There was consensus in both sessions that while there is great potential value in implementing collaborative design practices within AT, many companies would baulk at the potential resourcing regarding time, finances, and personnel to address this adequately. Subsequently, both focus groups debated the potential implications of a design sprint, including what could be achieved, the implications of participation, and what this may mean for intellectual properties and ongoing cost and benefits to participants in other scenarios.

3.5.2 Communication challenges
Within the design sprints, participants were observed to be highly skilled in communication and working in a transdisciplinary manner. However, both focus groups noted that this may not always be true. Participants noted that many had received training across the different spaces examined in this research and acknowledged that this likely supported them throughout the process. Another participant noted that while working in a very empathetic and responsive group during this process, not all PWLED may be comfortable voicing their fatigue or that they did not understand, which was reiterated by others.

3.5.3 Complexity challenges
Finally, all participants noted that the issues they investigated were highly complex. Complexity was tied to the heterogeneity of the population of PWLED, the environment (including natural, built, societal and political), and systems and policies already in place. PWLEDG5 noted;

“If we go back to the idea of having a person who can reflect the disability that you’re designing equipment for, you’ve got to look at the range of people who might be using it. For instance, you could have someone who is non-physical and non-verbal and someone at the extreme other end, and they all need a wheelchair, but they will all have very different perspectives and abilities within that need ...”

Unsurprisingly, four of the five solutions required a complex systems approach. This complexity was still present in conversations of the group working towards a specific product outcome (Figure 6) as they explored the issues surrounding the PWLED at a holistic level, including the complexities of implementing AT solutions.
3.6 Outcomes

Despite any challenges participants noted within their design sprint experience—or in applying collaborative design methods within the scope of AT—the overall discussions of the outcomes were that all participants had found the experience positive and beneficial. The processes resulted in both digital and physical prototyping (Figure 7). However, due to the complex nature of the issues being discussed, not all groups had resolved to a final solution at the end of the process (Table 2). Within the focus groups, most time was spent discussing the participants’ experiences and how they felt these tools might be used within a broader context. Critical themes within these discussions were empowerment, validation, and increased agency, which will now be discussed.
3.6.1 Empowering and validating
The themes of validation and empowerment from utilising a collaborative design process were evident throughout the discussions. Within the process, PWLED noted that they felt empowered and validated and saw the potential for these methodologies to improve the quality of life for PWLED. For example, PWLEDG3 noted;

"I think it’s that sort of a collaborative approach is really validating and exciting to know that you’re coming up with new ideas, but the things that matter, (compared to) the number of researchers and designs where (PWLED) think, ‘Oh, my goodness, that’s not even addressing the issue.’ ‘"

The potential for employment as a consultant within this process, in contrast to the current underemployment of PWLED, was another discussion point. Designers and OTs reflected this theme in their learnings and how they would transfer this to their daily practice.

3.6.2 Increased Agency
From both observation and discussion, it was evident that the process had been enjoyable and valuable for participants. Several participants reflected that they had found the process enjoyable for different reasons. Some valued their learnings from the process, for example;

“I’ve learned a lot, and a lot of assumptions I have around disabled people (have) been smashed just from doing a few walk-throughs with (PWLEDG2), so I really value the time that I’ve had over the last few days.” -DesignerG2

Others felt validated by the process, for example;

"I found it amazing, really, that (DesignerG1) and (OTG1) were so interested in me and what I found challenging". -PWLEDG1

Frequently, the enjoyment derived from the process was linked to the outcomes of the process, individual learnings, and overall utility. Secondly, while not articulated, the collaborative design process allowed for open, dynamic, and empathetic communication. This was evidenced in the observations of the groups who would move from solemn topics of human rights to areas of levity, including puns regarding levitating chairs. As most participants had never encountered each other prior to this study, it was noted that the playful nature of the design process allowed for communication barriers to be broken down quickly, and participants appeared to enjoy working within this space. This coupling of learning and enjoyment improved outcomes for participants and their experiences within this process.

4 Discussion
4.1 Design practice can assist in improving the autonomy and visibility of PWLED
Throughout the design sprint and subsequent focus groups, it was evident that the PWLED felt invisible in the current systems and community. This sense of invisibility for PWLED was present in all groups, with examples such as;
“...nobody ever asks you what challenges you encounter when you’re out and about. Most people don’t even consider it or know about it ... it is a really hard thing to create awareness about.” - PWLED2

These issues significantly impact the individual use of AT and the ability to participate in meaningful activities of daily living (Hersh, 2013; Quilliam et al., 2022; Rivas et al., 2021). This issue of empowerment of vulnerable populations is pertinent in design literature and a known health issue (Giordono, 2021; Micsinszki et al., 2022; Rivas et al., 2021).

Using design paradigms, particularly human-centred and participatory design methods, to engage with human rights and social justice is not new (Buchanan, 2001; Holeman & Kane, 2020). Current literature demonstrates how these design principles have inherent qualities that promote ethical activity and behaviour (Steen, 2015; Walton, 2016). Many of the factors of ethical design practice, as discussed by Steen (2015), including empowerment, the promotion of cooperation, cooperative curiosity, and cooperative creativity, were evident throughout this process, leading to participants feeling validated and empowered. Participants reflected on how this is needed at a societal level, for example:

“We don’t see the problem unless you’re in the wheelchair or using their product, so I think (collaborative design) is invaluable. And that’s also really empowering for the user. Who goes, ‘Oh, I am being listened to, and I can make a difference.’” - WLEDG1

This evidences how participants felt empowered by this process and saw the potential for similar processes in the community.

Considering the ongoing prevalence of the medical model which actively disempowers PWLED within healthcare (Olsson et al., 2013; Rocca & Anjum, 2020; Sangiorgi & Freire, 2010), the implementation of design practice may assist in exploring a way forward (Mäkelä et al., 2019; Nakarada-Kordic et al., 2021). A key factor highlighted in this process was that holistic, empathetic, and interdisciplinary practice was essential to this process. Subsequently, design practice allows for re-engaging empathetic, holistic, and interdisciplinary practice (Boger et al., 2017; Gauthier-Beaupré et al., 2022; Jones, 2016). While these factors are key within the health paradigm of person-centred care (Eklund et al., 2019), they are frequently underutilised due to healthcare's complexity and pressured environment (Olsson et al., 2013; Slater, 2006). However, when engaging in design practice within the context of health, such as within AT, there is the possibility to re-engage and not only improve health outcomes but empower and validate the targeted population, demonstrating how design may significantly impact individuals through systemic levels (Holeman & Kane, 2020; Jones, 2016; Valentine et al., 2017).

4.2 The role of design in systemic change

Considering the individual is inextricably linked to the surrounding environment, it is unsurprising that underlying issues of systems and policies had a significant role in consideration of the outcomes within the design sprints (Giacaman, 2018; Smart, 2006; Smart, 2009; Valentine et al., 2017). Throughout both sprints and presentations, it was apparent that the social and built environment and the systems and policies surrounding PWLED frequently impinging their ability to access the community and participate fully in meaningful activities, as is reflected by the literature (Giordono, 2021; Orkin, 2022; Rivas et al., 2021). An example is when a participant noted her exhaustion in meeting these challenges;
“There are so many obstacles and challenges and the ability to stop and break them down and work out solutions. It's easier sometimes just to hack it and push through. And that is where you need people to facilitate and advocate for you.”-PWLEDG3

These issues of disempowerment through policy can again be related to the ongoing presence of the medical model (Olsson et al., 2013; Sangiorgi & Freire, 2010) and the formulation of policy without the meaningful incorporation of PWLED throughout the process (Orkin, 2022; Rivas et al., 2021). These issues then trickle down to an individual level, where service delivery can lead to the abandonment of AT when the PWLED is not fully involved throughout the process, further impacting the individual (Federici et al., 2016; Larsson Ranada & Lidström, 2019).

These issues have led to PWLED being disenfranchised by the systems surrounding them and feeling that they do not have the power to make a difference (Barnes & Mercer, 2005; Rivas et al., 2021). However, despite these overarching systemic and environmental issues, the participants valued the collaborative design model as an opportunity to re-engage for positive change (Bovaird, 2007; Docherty, 2017; Valentine et al., 2017). While all participants noted the possibilities, comments from the PWLED participants that left the most substantial impact, for example;

“People with disability have to be involved in the same way as they have to be involved in this design process, to have our input right from the start, not tagged on at the end as a tick box.”

-PWLEDG4

This comment reiterates the need for change at a systemic level, which is reflected in the literature (Heylighen et al., 2016; Micsinszki et al., 2022; Persson et al., 2015). Here, design may significantly facilitate the disenfranchised to re-engage with the system and support change-making so that participants feel valued throughout the process (Micsinszki et al., 2022; Nakarada-Kordic et al., 2021; Rowe et al., 2020). With this, we start to address some of the barriers recognised throughout this process.

4.3 Barriers to practice

As discussed, many participants indicated they saw potential benefits in implementing a collaborative design process, reflecting the potential opportunities for design practice to facilitate re-engagement in a more holistic and empathetic practice (Holeman & Kane, 2020; Nakarada-Kordic et al., 2021; Rowe et al., 2020). However, implementing design processes within the context of health, let alone AT and disabilities, is highly complex and fraught with barriers (Heerings et al., 2022; Nakarada-Kordic et al., 2021; Ramos et al., 2020; Sanin et al., 2021). These issues were touched upon in participants’ challenges within this specific design sprint process, noting the potential for issues such as communication breakdown, the complexity of the issues and scarcity of resources. These issues are well documented in the literature surrounding implementing design practices within health (Ramos et al., 2020; Scariot et al., 2012; Wagenfeld et al., 2017).

Within the group discussion, the heterogeneity of PWLED was a frequently noted issue within design practice. For example, PWLEDG5 stated, “I think you probably should have a lot more than one disabled advisor”, in response to the complexity of the population. This issue is frequently cited in design literature as a complicating factor (Babbage et al., 2022; Heslop et al., 2019; Nakarada-Kordic et al., 2021). Other issues can include ensuring that individual participants understand what they have agreed to and the requirements regarding time and personal resources, particularly in cases where
there may be cognitive fatigue (Daly Lynn et al., 2016; Hendriks et al., 2018; Heslop et al., 2019). With this, while design methods may have an innately ethical approach (Steen, 2015), there is still a need for consideration of the safety of participants within the design process when working with marginalised and potentially disempowered populations such as PWLED (Babbage et al., 2022; Knight et al., 2021; Ramos et al., 2020).

This implication for requiring an ethical and rigorous approach leads to a frequently discussed issue: resourcing the implementation of a design process within this space. When asked what the barrier to implementing design processes to AT would be on an individual and systemic level, participants immediately noted issues relating to time, personnel and cost. These issues are not new, as the perceived high cost of implementing design methods within healthcare is well documented (Bryant et al., 2022; Donetto et al., 2015; Slattery et al., 2020). However, while there is a perceived high associated cost, both design sprints argued that the benefits of the process might offset these initial costs. These arguments demonstrated increased value in several ways, including:

1. Potential reduction in expenditure through improving the design, potentially reducing abandonment
2. Potential reduction in effort and cost to modify to fit PWLED needs post-production
3. Potential to improve market share from ‘better’ product

A second pervasive argument was that at a social level, more accessible AT might improve employment opportunities for PWLEDs and that acknowledging the value of lived experience would result in more employment opportunities within the community.

These arguments are represented in the literature surrounding design methods within health spaces, particularly social inclusion (Caixeta & Fabricio, 2021; Mäkelä et al., 2019; Robert et al., 2015). Here, design methods can support change and encourage improved practices that may result in sustainable employment opportunities (Holeman & Kane, 2020; Micsinszki et al., 2022). Demonstrating how design may support PWLED in improving individual quality of life and acting as an agent of change for social justice and human rights.

4.4 Study limitations

As this study was a pilot study, there were several limitations. While there were indications of change between the surveys, the sample was too small to prove any findings (De Winter, 2019; Shieh, 2020). Secondly, the literature notes siloing of practice between design and health (Nakarada-Kordic et al., 2021; Wagenfeld et al., 2017). However, due to recruitment strategies, all participants were interested in this area either professionally or personally, and there was a higher crossover of disciplines than was expected. Subsequently, this area would benefit from further investigation, including qualitative studies.

5 Conclusion

It is acknowledged that design practices can be corrupted into meaningless buzzwords when inexpertly incorporated into interdisciplinary practices, such as healthcare (Blomkamp, 2018; Steen et al., 2011). It is also acknowledged that AT issues are innately wicked, with no single solution (Boger et al., 2017; Buchanan, 1992). However, the results of this study and the supporting literature see the value of incorporating design practice within AT going forward.
With the complex and heterogeneous population and surrounding environments and systems, there is no one best practice approach to implementing collaborative design practice at this stage. We have learned the need for a reflexive and flexible practice that supports inclusion from the outset and the need to incorporate PWLED within the design of the collaborative approach.

Participants felt empowered and valued within the design sprints, and the collaborative process allowed for empathetic and holistic practice, demonstrating the potential of design practice to improve outcomes for PWLED. While current health practice understands the need for empathetic and holistic practice, it is frequently lost in the complex and resource-poor space. Here, design practitioners can collaborate with healthcare professionals and PWLED to re-engage at a more personable and user-centred level, improving human rights and social justice outcomes.

While the potential for collaborative design to improve AT outcomes is clear, systemic boundaries remain to implementation. These boundaries stem from a lack of understanding and devaluing within the system of the lived experience of PWLED and the design process itself. Subsequently, further work needs to be conducted on facilitating a dialogue between design and the overarching health systems to communicate this potential and further explore how design practice can work within the constrained space of AT.

References


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