Towards a Critical Participatory Design Approach for the Neurodivergent: A Case Study for Students with ADHD

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Abstract

This thesis critically examines how existing frameworks for the design of assistive technologies for neurodivergent people, e.g., those with attention-deficit hyperactivity disorder (ADHD), primarily operate from a medical and deficitary view where ADHD-focused technology aims to reduce undesirable characteristics and behaviours. Drawing on agonistic participatory design principles, this thesis seeks to reevaluate current design practices of assistive technologies, breaking away from traditional paradigms and challenging the prevailing notions that have often overlooked the unique needs of neurodivergent individuals. A participatory design workshop involving students with ADHD serves as the centrepiece, fostering collaborative innovation in the creation of ADHD-friendly technologies. This thesis critically reflects on the challenges and opportunities presented by this approach, discussing the themes that have emerged from the workshop. By reappropriating agonistic participatory design in human-computer interaction (HCI) research, the thesis aims to provide a nuanced perspective on creating technologies in project-based settings that not only accommodate but empower neurodivergent individuals. Through a thematic analysis and subsequent discussions of the emerging themes, this research contributes to a broader understanding of the effectiveness and implications of adopting an agonistic participatory design approach in developing more neuro-inclusive technologies.

Keywords: participatory design, neurodiversity, ADHD, feminist STS

Introduction

In recent years, designing technologies for neurodiverse people, e.g., persons with dyslexia, autistic spectrum disorder (ASD), and ADHD, has increased academic interest in the field of HCI. Many design scholars aim to support, help, or accommodate neurodivergent people by designing assistive technologies (Frauenberger et al., 2017; Sonne et al., 2016).

However, the design of these technologies for individuals with ADHD often falls short of genuinely accommodating their unique interaction patterns and cognitive styles.

ADHD is clinically defined as a mental disorder according to the Diagnostics and Statistical Manual of Psychiatric Disorders (APA, 2013), known as the “DSM-5”. It is estimated that ADHD affects a substantial percentage of the population, with studies indicating prevalence rates of around 5% among children and 2.5% among adults (Simon et al., 2009; Thomas et al., 2015). Those who have ADHD experience difficulties with inattention, hyperactivity, and impulsivity, as they often struggle to organise tasks or activities, fail to complete tasks or get frequently easily distracted by extraneous stimuli. Furthermore, studies have shown that ADHD has a negative impact on virtually every aspect of daily social, emotional, academic and work functioning (Barkley, 2006). Later in life, adults with ADHD are more likely to develop depression and personality disorders than their non-ADHD peers and are more likely to have employment difficulties (Carter et al., 2012; Fischer et al., 2002). These prevalence and difficulties underscore the societal and economic imperative to integrate the needs of individuals with ADHD into technology design effectively.

However, traditional HCI design methodologies often adhere to normative medical standards that do not fully encapsulate the diverse experiences of users with ADHD, inadvertently marginalising them. This oversight has profound implications, not only limiting the utility and accessibility of technologies for this group but also reinforcing the exclusionary practices that pervade technological development (Hamraie & Fritsch, 2019; Spiet et al., 2022). As a result, there exists a disconnect between the potential of technology to enhance life quality and the actual experiences of users with ADHD.

Spiel et al. (2022) conducted a critical literature review of technologies for people with ADHD. They concluded that most research projects did not meaningfully include them in their design sessions. Most of the literature also subscribes to the idea that ADHD needs to be cured, resulting in “behaviourist interventions that aim at disciplining people with ADHD into acting more neurotypically” (Spiel et al., 2022, p. 16). This pathologisation of ADHD in technology design research ultimately leads to ineffective technologies which primarily embody neuronormative design rather than neurodivergent needs and desires and evoke a sense of disempowerment, causing them to reject the technology that was intended to support them in daily life (Spiel et al., 2022; van Huizen et al., 2022).

To make technology design more inclusive toward neurodivergent people, I implement and argue for a participatory design (PD) approach for HCI as an alternative and counter-hegemonic way to innovate and design fairer technologies (Lynch, 2020). PD is a research methodology that tries to understand users' tacit knowledge through designing, i.e., producing artefacts. At the same time, it “envisions, shapes, and transcends [the design process] in ways [users] find it to be positive” (Spinuzzi, 2005, p. 164). It gives more credence to the users as inherently knowledgeable (Hamraie & Fritsch, 2019; Spinuzzi, 2005). The PD workshop, central to this thesis, serves as a microcosm of this inclusive methodology, providing empirical evidence of its efficacy and potential for broader application.

Moreover, I use Björgvinsson et al.’s (2012) *agonistic participatory design* as an analytical and practical lens, as this approach is most salient for renegotiating power relations with marginalised communities. However, their paper moves away from design projects to public spaces. Hence, I argue for a hybrid approach called *agonistic design space* to ameliorate agonistic PD that focuses on engaging with marginalised social movements and challenging hegemonic structures with traditional PD within organisationally rigid structures. Moreover, the subsequent PD workshop will involve students who claim to have some ADHD traits or symptoms.

The rationale for focusing on students with ADHD in the empirical research is twofold. First, there exists a notable gap in HCI design for young adults with ADHD, particularly as they transition from educational settings to the workforce – a critical juncture that can shape their future career trajectories and overall well-being. Second, students represent a demographic actively shaping their identity and developing strategies to navigate academic and impending professional challenges. By engaging with this group, the research taps into a dynamic intersection of development, technology use, and workforce entry, providing valuable insights for HCI design that can support these individuals in actualising their potential in the workplace (Doyle & McDowall, 2021; Spiel et al., 2022).

Conclusively, this thesis seeks to illuminate the shortcomings of current HCI practices in designing for ADHD and demonstrate how PD can bridge these gaps. A PD workshop offers a concrete example of how inclusive design practices can be implemented, highlighting the importance of directly involving users in creating technologies that will shape their lives.

Research Question and Contribution

The research question and subsequent sub-questions are as follows:

1. How could a participatory approach to HCI design contribute to neuro-inclusive technologies for people with ADHD?
    a. How do we conceptualise neurodiversity and its relationship with ADHD?
    b. What is the relationship between neurodiversity, technology, and design?
    c. What are the key benefits and challenges of employing a PD approach in developing neuro-inclusive technologies for students with ADHD?

This thesis explores alternative design approaches for people with ADHD toward more socially just disability relations. It seeks to address the literature gap of HCI research solely relying on the medical/pedagogical research of ADHD by proposing a more critical and holistic view of technology design. An agonistic PD approach for technology design is proposed that considers the perspectives of marginalised groups (Björgvinsson et al., 2012) and examines ways in which technology can be rethought to meet the needs of the neurodiverse population better (Hamraie & Fritsch, 2019). Through literature research and a case study, this thesis proposes a framework for a critical design approach that prioritises the experiences and perspectives of neurodiverse people.

By engaging with these questions, this thesis aims to make a dual contribution. Theoretically, it enriches the academic discourse on neurodiversity and its relationship with technology. In particular, neurodiversity plays a pivotal role in how we understand the mind and body in relation to science and technology. Practically, it provides an actionable approach for creating better design practices and more inclusive technology within the field of HCI that can enhance the lives of those with ADHD.

Thesis Structure

The thesis is structured to guide the reader through systematically exploring the PD process and its implications for individuals with ADHD. Each chapter partially answers the main questions by attempting to answer the subsequent sub-questions.

- **Chapter 1**, "Neurodiversity and ADHD," lays the historical and political groundwork by examining the evolution of disability studies and the neurodiversity movement.
- **Chapter 2**, "The Intersection of Technology, Design, and Neurodiversity," looks at technology's role in shaping society and how feminist Science Technology Studies (STS) provides a critical framework for understanding these dynamics.
- **Chapter 3**, "Case Study: Co-Design ADHD Technology," presents the empirical findings from the PD workshop, offering a nuanced understanding of the practical challenges and benefits of creating technologies that accommodate neurodiversity.

The conclusion synthesises the insights gained throughout the thesis and proposes a path forward for researchers, designers, and organisations committed to fostering an inclusive digital world. Each chapter builds upon the last, culminating in a comprehensive understanding of the PD as a pathway to more equitable and functional technology for the ADHD community.

Chapter 1 – Neurodiversity and ADHD

> *"Growing up, fat, black, female, and almost blind in America requires so much surviving that you have to learn from it or die."*
>
> (Lorde, 2020)

In this chapter, "Neurodiversity and ADHD," we embark on a journey to explore the intricate relationship between neurodiversity and ADHD. The chapter is divided into "Contesting Disability" and "The Neurodiversity Movement." The first section delves into the evolution of disability studies, examining the shifts in societal perceptions and treatments of disability, with a particular focus on ADHD. This section sets the stage for understanding the broader context within which ADHD is situated in the neurodiversity movement. The second section delves deeper into the neurodiversity paradigm, particularly how it reshapes our understanding of ADHD and the role of autistic people in advocating for this paradigm shift.

Contesting Disability

The Disability Rights Movement and the Politics of Disability

The abbreviation of ADHD refers to a condition that highlights the importance of discussing disability in the context of this thesis. It literally uses the word *deficit* the describe the mind, implying there is a *lack*, *defect*, or *fault* that needs to be *fixed* or *patched*. It is characterised as a *chronic illness* that needs to be *treated* and *healed* (Harpin, 2005). ADHD is a disability that impairs one's mental functioning. Therefore, one should strive to help those with disabilities overcome them. However, there seems to be a presumptive self-evident fact that a disabled person does not want to be disabled and desires a "normal" body; public institutions should be arranged so that the best course of action is to treat the disease and relieve the body from its suffering.

These proponents are aligned with the so-called *medical model of disability*. The medical model of disability typically frames bodies as “deviant, pathological, and defective” (Kafer, 2013, p. 5), thus best understood in terms of medicalised symptomology, i.e., solving the problem of disability by “correcting, normalising, or eliminating the pathological individual” (Kafer, 2013, p. 5). It is to improve the functioning of the disabled person, where “functioning is defined by both statistical measures and cultural ideals such as independence, economic productivity, and sociability” (Rosqvist et al., 2020, p. 4). It problematises disability as a defect or disorder that resides exclusively in the individual and explains disability solely as a biological impairment that deviates from the norm (Charlton, 1998; Shew, 2020). Consequently, this problematisation ultimately results in *ableism*, which is “a preference, explicit or not, for bodies and minds that are nondisabled and the resulting negative attitudes toward disability and disabled people” (Shew, 2020, p. 41), underpinning the practices and environment that exclude, marginalises, and discounts first-hand accounts of the experience of disabled people.

However, many view their impairment as an important identity or experience rather than a tragic occurrence. In order to move against the medical model of disability and its subsequent ableism, people in the United States with a broad array of physical disabilities have formed a social movement seeking rights for physically disabled people: the disability rights movement. The movement started as loosely coupled networks of local communities and campus students, i.e., grassroots organisations, and attempted to redefine disability through political and legal action (Scotch, 1989, p. 380). Disabled activists organised the Capital Crawl gathered at the U.S. Capitol to protest for the passage of the Americans with Disabilities Act (ADA). Some crawled up the Capitol steps to symbolise the barriers they faced due to a lack of accessible infrastructure (Shapiro, 1994). The American Disabled For Accessible Public Transit (ADAPT) group became well-known for their disability activism around wheelchair-accessibility for public buses in the city of Denver by blocking buses with wheelchairs or smashing curb cuts with sledgehammers and pouring curb ramps with bags of cement (Hamraie, 2017; Shapiro, 1994).

Furthermore, the disability rights movement drew inspiration from other civil rights movements. Examples such as the black civil rights and feminist movements were provided of political action and ideological frameworks, which have served as a source of inspiration and cooperation (Scotch, 1989). The “504 Sit-in”, a disability rights protest where disabled people occupied federal buildings to demand greater accessibility and accommodations for disabled people, was partly supported by the Black Panther Party (Nielsen, 2012, p. 169). Feminist analytical frameworks have given disability rights activists “theoretical tools to think critically about disability, the stigmatisation of bodily variation, and various modes and strategies of resistance, dissent, and collective action” (Kafer, 2013, p. 14).

The disability rights movement has risen globally, creating a new understanding of human rights and solidifying the movement’s attitude toward various UN policies and international declarations (Sabatello, 2013). The dominant definition of disability was contested: the problem of disability is not about individual impairments, limitations, or alleged failures and hardships of disabled bodies, but rather “located in inaccessible buildings, discriminatory attitudes, and ideological systems that attribute normalcy and deviance to particular minds and bodies” (Kafer, 2013, p. 6) that causes “further psychological disability via a culture and ideology of ‘normalcy’” (Jurgens, 2020, p. 74).

This shift from individualising toward communalising disability is what scholars call the *social model of disability*. Rather than looking at the structure in which people are valued or not by their economic or cultural benefit and labelling them as disabled, which has historically happened in the medical/individual view of disability, this model tries to understand the contextual norms in which disability is measured and emphasises identifying systemic barriers and social exclusion. A distinction is made between the terms *impairment* and *disability* (Kafer, 2013). In this model, impairment refers to the actual attributes (or lack thereof) that affect a person, such as the inability to walk or breathe independently. *Disability* is now redefined as the restrictions caused by society when it does not give equitable social and structural support to the needs of disabled people.

As mentioned before, physical disability was first critically engaged, leading to discourse in planning and designing public institutions, services, and infrastructures such that disabled people could access socio-material space (Titchkosky, 2011). Moreover, certain traits are only recognised as disabilities in particular social and environmental structures. If a given society is predominantly illiterate, dyslexia would typically not be considered disabling. Similarly, when an island was home to a large population of Deaf people and most residents knew sign language, deaf individuals were not excluded or isolated. They did not experience disability (Shew, 2020).

In this thesis, a significant focus is directed towards critiquing the DSM, a cornerstone in psychiatric diagnosis predominantly stemming from the USA. The emphasis on the DSM is both a reflection of its global influence and the fact that much of the available literature in the field is rooted in U.S.-centric paradigms. Over the years, this centrality of the DSM and the weight of American scholarship in the field have constructed a dominant narrative that often overshadows alternative perspectives and diagnostic criteria.

However, it is crucial to recognise that the DSM, despite its widespread use, is but one of several diagnostic systems globally. Different countries and cultures possess diagnostic criteria, tools, and approaches, each shaped by their unique socio-cultural contexts and historical trajectories. For instance, the International Classification of Diseases (ICD) developed by the World Health Organisation (1978) is another critical diagnostic tool with a broader international scope. Therefore, it is essential to emphasise that while this work predominantly critiques the DSM and the accompanying U.S.-based literature, it does so with an acute awareness of the broader landscape of mental health diagnosis. This critique does not dismiss other perspectives but focuses on examining a particularly influential paradigm.

Disabled Bodies: Does the Mind Matter?

The Interplay of Body and Mind: Bodyminds

Historically, discourses on disability have been inseparably linked to notions of the body and mind. The socio-political landscape, filled with ideals and stigmas, has often defined disability in terms of physical and mental "limitations" or "deviations." Such narrow viewpoints emanate from foundational philosophical inquiries, chiefly the age-old debate on the relationship between the mind and the body. By delving into the intricacies of this debate, one can better understand how societal perceptions of disability, particularly in the realm of neurodivergence, have been shaped and, more crucially, how they might be reconceptualised. Engaging with the philosophies surrounding the mind-body problem is not merely an intellectual exercise. Instead, it is central to rethinking and redefining the politics of disabled bodies and minds in contemporary society.

The delineation of the body and mind (or the relationship between mental and physical properties) has been a contentious subject of philosophical debate. At the heart of this is the dualism proposed by René Descartes (“Cartesian Dualism”), who asserted that the mind (*res cogitans*) and the body (*res extensa)* are distinct entities, with the former being immaterial and the latter mechanistic (Descartes, 1984). This foundational assertion arose from his method of radical doubt, where he sought to dismantle all beliefs that were not absolutely certain. His famous quote, “Cogito, ergo sum” (“I think, therefore I am”), underscored the certainty of the existence of the mind and its distinctness from the physical body (Descartes, 1984).

However, this dualistic perspective has been challenged over the centuries. Particularly, disability scholars and activists argue that the implicit dualistic framework of body and mind can have harmful implications, particularly when understanding the lived experiences of disabled people. By segregating the mind from the body, it perpetuates a problematic hierarchy which contributes to a skewed and stigmatised view of the body. Disabilities, which often manifest physically, are then perceived as deviations from the "norm", whereas the intellectual and mental faculties are treasured and seen as the hallmark of humanity (Wendell, 2013).

Moreover, in feminist theory, Price and Shildrick (1999) argue that dualism has, directly and indirectly, resulted in the marginalisation of bodies different to the 'male standard', as the body "is positioned as an object apart, something upon which the forces of biomedicine act, and of which women must struggle to regain control" (Price & Shildrick, 1999, pp. 146–147). They offer a new perspective on the body to see beyond Enlightenment claims of universal truths. The split reinforces societal norms that privilege certain kinds of bodies and minds while othering those that do not fit these norms. Such a dichotomy, they suggest, is not merely philosophical but has real-world consequences, especially in terms of access, representation, and rights for disabled bodies "as a peculiarly feminine condition" (Price & Shildrick, 1999, p. 435).

The concept of *bodyminds*, emerging from material feminist disability studies, is starkly contrasted with dualism. It recognises the profound interconnectedness of mental and physical experiences, rejecting the binary separation proposed by some Western philosophers (Dychtwald, 1986; Siebers, 2008). Bodyminds encapsulate the idea that our bodily and mental experiences are not just linked but indivisible. For instance, chronic pain, a physical experience, can have profound cognitive and emotional effects. Conversely, mental health conditions can manifest physically. Perception and subjectivity are deeply intertwined with our physical existence (Merleau-Ponty, 1945).

By challenging dualistic notions, bodyminds also critique societal structures that segregate based on physical or cognitive abilities. The society, built upon dualistic foundations, often marginalises those who do not fit certain norms. Recognising the bodyminds' interconnection can foster a more inclusive society that does not discriminate based on arbitrary distinctions between body and mind (Wendell, 2013). Moreover, its framework also has implications for the empowerment and agency of disabled people. Recognising the integral connection between body and mind calls for more inclusive practices, policies, and approaches that respect and acknowledge the holistic experience of disabled people rather than reducing them to just their disabilities (Kafer, 2013).

In conclusion, while Cartesian dualism has significantly influenced Western thought, critical disability studies, through concepts like bodyminds, provide a compelling critique and alternative perspective of the mind-body problem. Recognising the intrinsic connection between the mind and body offers a more holistic and inclusive framework that paves the way for a more equitable understanding of disability, selfhood, and identity.

Disabled Bodyminds: A Critique

Disability became a new social categorisation in intersectionality studies, an analytical framework for understanding how the various and overlapping social and political identities result in unique combinations of discrimination and privilege (Crenshaw, 2017). It identifies multiple advantages and disadvantages (Runyan, 2018). It acts as a metaphor to elucidate "the structural convergence among intersecting systems of power that created blind spots" (Collins, 2019, p. 26) in ongoing struggles and friction to resist social inequalities brought about by racism, sexism, colonialism, capitalism, and similar systems of power. Disabled people as interlocutors resisted the dominant cultural narratives that disability is an individual aberration. They were ‘proud’ of their disabled bodies (Barnes, 2016; Shew, 2020). As mentioned earlier, where two seemingly distinct movements supported each other (Independent Living and Black Panther Party), intersectionality offers a provisional concept to frame different social problems as alliances for “resistance to oppression” (Crenshaw, 2017; Collins, 2019, p. 28).

However, while critical disability studies acknowledge that any form of disability can be entangled in systems of oppression, they do not critically engage enough on matters of the *mind*. Disability is framed chiefly as something apparent and obvious (imagine the person in a wheelchair or someone missing an arm or leg), yet for people with cognitive disabilities, that has not always been the case. A normative assumption that a person can typically function while having an invisible (mental) disability will most likely lead to other distinct issues and framings of the bodymind. Even though Kafer celebrates the diversity of disability, she only holistically tackles “disability futurity” (Kafer, 2013, p. 33) by “conflating all experiences of physical, mental, or sensory limitation without regard to structural inequality or patterns of exclusion and discrimination” (Kafer, 2013, p. 13), inserting minds in a very tokenistic way and failing to consider fully its implications.

Moreover, when Barnes (2016) builds her theory of disability by conceptualising disabled bodies as *minority bodies,* she explicitly leaves out cognitive disability, staying agnostic about the mind and its relation with the body. The majority of critical scholars prefer to speak of bodyminds rather than dichotomous body-and-minds in order to emphasise that mental disability matters, but no one has “moved anywhere with the problem that *body* and *mind* tend to be treated as rhetorically distinct” (Price, 2015).

However, in *Minority Minds*, Carter (2023) extends Barnes’ account to include mental disability, shedding light on this oversight in disability studies. She argues that her concerns about including mental disability as making the term ‘disability’ more difficult to define are misplaced. In every step that Barnes takes in her argumentation to build her positive account of physical disability, Carter argues that a reinterpretation of the same arguments that are purely mental in nature can be straightforwardly demonstrated to include mental disability, ultimately providing a holistic understanding of the bodymind.

For instance, in deflating naturalistic definitions of disability, Barnes notes that disability is a departure from normal functioning, drawing on an idea of species design for which survival and reproduction functions are paramount. In her counter-example of Olympic swimmer Michael Phelps, the same physical attributes that make him a good swimmer may also shorten his life due to the extreme training regimes he must endure to compete, which is the opposite of survival – but he is still demonstrably not a disabled person. In the same argumentative manner for mental disability, Carter writes that “high levels of intelligence have been demonstrated to correlate with lower levels of fertility, meaning highly intelligent people are less likely to engage in the species typical reproduction of offspring successfully, yet high intelligence, by itself, is not a disability” (Carter, 2023, p. 362).

The paper underscores the pressing need for disability studies to engage more profoundly with cognitive and neurological variances. It suggests that merely acknowledging them is not sufficient. A more in-depth exploration is needed to represent the diverse spectrum of disabled experiences truly.

The critiques above point towards an emerging necessity: the acknowledgement and deep engagement with neurodiversity. If bodyminds are inherently interconnected, sidelining or superficially engaging with the aspect of the mind is not just an academic oversight but a systemic one. Neurodiversity, which foregrounds cognitive and neurological variances not as disorders but as natural, valuable variations, offers a pathway. By integrating neurodiversity into disability studies, we can work towards a more holistic understanding that genuinely represents the vastness and richness of human experiences.

The Neurodiversity Movement

Autism Rights and Neurodiversity: A New Paradigm?

Neurodiversity refers to the diversity of neurology across the entire human species, emphasising the diversity of cognitive processing or cognitive styles (Spiel et al., 2022; Walker & Raymaker, 2021). The term was initially coined by sociological researcher Judy Singer (1999), an Australian social scientist who identifies as autistic, and proposed a new category for intersectional analysis through her participant observation work of online autistic self-advocacy groups. She based it on the concept of biodiversity: the more diversity within an ecosystem, the more resilient and sustainable it would be. It is now recognised and used as a "banner term for emerging social movements for civil rights for people with various devalued, medically labelled neurological conditions" (Milton, 2020, p. 3). Moreover, in a non-reductionist and non-essentialist way, Walker defines neurodiversity as "a convenient shorthand for the functionality of the whole bodymind and the way the nervous system weaves together cognition and embodiment" (Walker & Raymaker, 2021, p. 6).

Autism is a lifelong developmental condition that affects how individuals perceive the world and interact with others. Juxtaposed to the *pathology paradigm* (Walker & Raymaker, 2021), where autism is historically viewed as a disorder that needs to be cured, the *neurodiversity paradigm* challenges this perspective. Autism-related discourse and practices are dominated by medical pathology or psychiatric disorders in which research is done to eliminate, prevent, or cure autism (Bovell, 2020). Due to the pathologising of autism, negative societal attitudes towards autistic people were dominant, resulting in autistics being "stigmatised, misrepresented, dehumanised, abused, harmed, and traumatised by professionals and by their own family" (Walker & Raymaker, 2021, p. 5). Autism was frowned upon and seen as "a tragedy and even epidemic" (Milton, 2020, p. 4), leading autistic people to mask their symptoms and live disingenuous and unfulfilling lives, exacerbating their symptoms and comorbidities (Price, 2022). It was the non-acceptance, pathologisation, and derogatory attitudes toward the autistic person that was the problem, not the autistic person itself (Sinclair, 2012).

Autistic people have played a pioneering role in the adoption and popularisation of the neurodiversity concept. Their lived experiences and some of them pursuing academia have helped flesh out the theoretical underpinnings and the praxis of the neurodiversity paradigm (Kapp et al., 2013). To give an example, historically, many studies suggested that autistic individuals have a "deficit" in theory-of-mind, implying that they inherently struggle to understand and interpret others' thoughts and feelings and that they would lack such concepts. However, within the neurodiversity paradigm, this notion has been vigorously critiqued and refuted (Gernsbacher & Yergeau, 2019).

Moreover, as the neurodiversity movement continues to flourish, there is a growing interest in understanding the intrinsic characteristics of the autistic experience beyond the pathology paradigm. Instead of focusing on the deficits, researchers within the neurodiversity paradigm aim to explore the unique strengths, experiences, and perspectives of autistic people.

Milton (2012), for instance, introduced the concept of the "double empathy problem" – the idea that misunderstandings between autistic and non-autistic individuals are a two-way street. This concept posits that the challenges in understanding are mutual, stemming not from a deficit of the autistic person but from inherent differences in communication and perception between the neurotypical and neurodivergent groups. Furthermore, some works emphasise understanding autistic experiences in their own right, exploring areas like stimming (repetitive body movements such as finger-flicking or hand-flapping), special interests, sensory sensitivities, and non-standard communication as intrinsic and valuable facets of autistic lives (Kapp et al., 2019).

Furthermore, drawing parallels with the broader disability rights movement of the 20th century, the neurodiversity movement, with a focus on autism, became a powerful voice against the pathology paradigm. Just as disabled activists of the past rallied against societal barriers and prejudiced notions, autistic people under the banner of neurodiversity have fought for their right to exist, be accepted, and flourish on their terms (Chamak, 2008).

As the neurodiversity movement grew, its influence was not restricted to autism alone. Other neurodivergent communities began resonating with its messages. In the subsequent section, I will critically reflect on how a particular ADHD community positions itself within or against the neurodiversity paradigm, examining both shared perspectives and unique challenges of neurodivergence.

Neurodiversity for ADHD?

ADHD is a topic of enduring debate and evolving understanding within clinical circles and public discourse. Frequently, contemporary issues surrounding ADHD intersect with broader neurodivergent communities, highlighting shared challenges and distinctive experiences. This section examines the current literature on ADHD, emphasising its position within the neurodiversity movement and its overlap with other neurodivergent groups.

Moreover, the neurodiversity paradigm is not a uniform entity. Many scholars are contributing to this paradigm in various areas of expertise. Naturally, there are some differences in interpretation among different groups and members of the movement. In the following sections, I will describe the inherent issues in ADHD and critically reflect on the position of an online ADHD community and how it disagrees with some of the elements of the neurodiversity paradigm.

Contemporary Issues in ADHD: A Literature Review

The neurodiversity paradigm has been instrumental in reshaping perceptions of ADHD. Scholars and advocates argue against the pathologisation of ADHD, highlighting the need to understand it in the context of societal norms and educational systems that often fail to accommodate diverse learning and behavioural styles (Armstrong, 2011). Contemporary discussions around ADHD within the neurodiversity movement focus on creating supportive environments that cater to diverse neurological needs rather than insisting on conformity to a neurotypical standard. For example, Hartmann's "hunter vs. farmer" concept posits that ADHD traits are not deficits per se but attributes that serve evolutionary functions and still offer modern-day advantages in specific contexts (Hartmann, 2019).

Moreover, recent scholars in critical disability studies urge a more nuanced understanding of ADHD through an intersectional lens, acknowledging that factors such as gender, race, and socioeconomic status significantly influence the experience, management, and diagnosis of ADHD. Children from marginalised communities receive ADHD diagnoses at different rates, influencing their access to resources and support (Morgan et al., 2013; Shi et al., 2021). Moreover, gender plays a particularly pronounced role in the ADHD experience. Research has shown that girls and women are less likely to be diagnosed with ADHD. The reason is that symptoms do not align with the stereotypical hyperactive behaviour more commonly associated with boys, leading to a lifetime of missed opportunities for support and understanding, resulting in secondary issues such as low self-esteem, anxiety, and depression (Morgan, 2023; Nerenberg, 2020).

The medical treatment of ADHD, mainly through stimulant medications, is an area fraught with cultural narratives and commodification concerns. While medication can be life-altering for many, offering the ability to regulate attention and impulse behaviours, it also raises questions about the medicalisation of behaviour and the influence of pharmaceutical companies (Conrad, 1976). The commodification of ADHD medications has been critiqued by scholars who argue that it reflects broader cultural narratives about performance, productivity, and the prioritisation of certain cognitive styles valued by capitalist societies (Moynihan & Cassels, 2008). These narratives contribute to the stigma surrounding ADHD, often portraying those who do not conform to these cognitive styles as in need of medical intervention to correct their divergence. Moreover, the cultural discourse around ADHD medication often neglects the subjective experience of those taking it, sometimes ignoring the complex ways individuals relate to their medication as part of their identity or daily functioning (Singh, 2003).

Furthermore, ADHD does not exist in a vacuum; it often overlaps with conditions such as ASD, dyslexia, and other neurotypes, reflecting the complex nature of neurodevelopmental profiles. The notion of neurodiversity recognises this intersectionality and captures a spectrum of neurological experiences where ADHD may share specific cognitive and behavioural patterns with other conditions (Thomas et al., 2015). Individuals who inhabit these overlapping neurodivergent identities often face unique challenges. For example, the presence of ADHD symptoms in autistic individuals can complicate diagnosis and intervention strategies, necessitating a more nuanced understanding of how these conditions interact (Asherson et al., 2016).

The shared experiences among neurodivergent groups can also foster a sense of solidarity and community, promoting advocacy and support networks that span beyond specific diagnostic categories. This can be seen in the rise of neurodiversity-affirming practices and (online) support groups that emphasise understanding and celebrating differences rather than pathologising them (Robertson, 2010; Saha & Agarwal, 2015).

Critical Reflections on the Position of /r/ADHD

/r/ADHD is an online inclusive, disability-oriented peer support group for people with ADHD with over 1.7 million members. While this group does not encompass the position of all ADHD communities or people with ADHD, this thesis intends to demarcate and elucidate the differences (or similarities) between different neurodiversity groups and their contestations with current scholarly activities within the neurodiversity paradigm. For instance, identity-first language is preferred by the autism community ("autistic person"), while on the other hand, ADHD has not widely been accepted as an identity due to its negative and false implications. It seems that a person-first language ("person with ADHD") is more accepted.

While the ADHD community does not deny the principle of neurodiversity as a subset of biodiversity (i.e., a property of the human species), they have significant reservations about the political movement formed around these terms and their rhetoric. Due to a barrage of harassment from other neurodivergent communities, the moderators have written up a response[1] and subsequently enacted changes for policing neurodiversity-related discussions on their website. I will critically reflect on their response, to get a better understanding of how ADHD is positioned in the landscape of neurodiversity.

First, they disagree that mental health disorders are just "differences in cognition". These conditions come with genuine innate harm. As mentioned earlier, the social model of disability argues that a person with an impairment does not necessarily need to feel disabled; disability stems from the lack of support systems and systemic barriers. However, it seems that the social model overlooks the life-threatening impact of impairments themselves. It is not apparent how the social model could help a person with chronic pain, for instance. Suppose you can change the entire system that fully supports and accommodates that person.

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[1] r/ADHD's position on neurodiversity: https://www.reddit.com/r/ADHD/comments/ms95dl/radhds_position_on_neurodiversity/

That person will still experience something undesirable regardless. Similarly, stating that a person with ADHD would have thrived more in a hunter-gatherer culture (Hartmann, 2019) as a narrative tool in an already marginalised group is not helpful for those who seek online support and help for their impairments.

This critique is a valid concern and is greatly overlooked in disability studies. In Price's (2015) article about the bodymind problem and the possibilities of pain, she echoes the sentiment that disability studies have put too much focus on the desirability of disabled bodies and less so on the undesirability of disabled bodies. Through conceptualising pain as a counterpart of desire, she argues that social or political contexts sometimes do not matter when it comes to mental suffering and are thus inherently undesirable. Even though her arguments are for fringe or "limit cases" (Price, 2015, p. 10) of unbearable mental pain, there still seems to be an essentialist notion of the body within the works of disability studies. Even Kafer admits that she does not wish to become "more disabled" (Kafer, 2013, p. 4) than she already is.

Second, r/ADHD believes there is a real risk in framing mental health disorders as "gifts", "beneficial" or "positive". They claim that it would lead those in power to believe that people with ADHD do not need or deserve medication or accommodation and that a neuronormative *status quo* remains. Indeed, when the paradigm progressed towards a more neurodiverse perspective, rather than only focusing on the deficit view and weaknesses of ADHD, scholars tried to fill in the gaps by exploring the benefits of ADHD, such as strength (Honos-Webb, 2010), creativity (Healey & Rucklidge, 2006), entrepreneurial performance (Hatak et al., 2021) or resilience (Charabin et al., 2023).

However, the claim seems to conflate the desirability of disabled minds (i.e., neurodiversity pride) with a *prescriptive* notion of how bodies *should* be treated. For the former, desiring disabled bodies suggests that disabled bodies are value-neutral (Barnes, 2016) in that “values difference and resists dualisms such as straight/queer or abled/disabled” (Price, 2015) to which the community of /r/ADHD fully agree[2]. In other words, when autistic people proclaim they are proud of who they are, the ADHD community should not perceive that the inherent hardships and difficulties that culminate from ADHD should be celebrated. Rather, having ADHD is a mere-difference (Barnes, 2016; Carter, 2023), which should be valued in and of itself. The latter, which I believe they are arguing against, is the value-laden judgements imposed by other neurodiversity communities, ironically dividing “us” from “them”.

Indeed, the trend of self-diagnosing ADHD has sparked a contentious debate in both clinical and public domains. Critics often point to the risks of tokenisation and fetishistic appropriation, where ADHD characteristics are trivialised and romanticised, detracting from the lived experiences of individuals clinically diagnosed with the disorder (Eagle & Ringland, 2023; Locke, 2023). This phenomenon raises concerns about the dilution of the seriousness of ADHD and the potential for misrepresentation and misunderstanding of the condition (Barkley, 2002). However, reframing mental health disorders and normalising them can help reduce stigma and encourage more people to seek help and support through online peer support (Eagle & Ringland, 2023; McIntosh et al., 2022). This perspective underscores that the issue is not so much about “gatekeeping” diagnoses but rather about how society perceives and judges different experiences and mental health.

Third, r/ADHD cannot accept or reject the medical model of disability. They deem it a necessary foundation that enables the treatment of ADHD and many other mental health disorders with medicine and other medical interventions, believing that both the medical and social models of disability are valuable to improving the lives of people with ADHD. The

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[2] From the post: “ADHD is neither a blessing nor a curse, it simply *is*¸and we must find ways to alleviate any distress or suffering it may cause.”

neurodiversity paradigm explicitly rejects the medical model, as Walker (2021, p. 6) stated that:

> The two paradigms – the pathology paradigm and the neurodiversity paradigm – are as fundamentally incompatible as, say, homophobia and the gay rights movement, or misogyny and feminism. In terms of discourse, research, and policy, the pathology paradigm asks, “What do we do about the problem of these people not being normal,” whereas the neurodiversity paradigm asks, “What do we do about the problem of these people being oppressed, marginalised and/or poorly served and poorly accommodated by the prevailing culture?”

From a historical perspective, I can empathise with autism rights activists like Walker, who reject previous paradigms that appear incompatible with the neurodiversity paradigm. Their neurodivergence was met with eugenic practices, social isolation, and psychiatric incarceration (Waltz, 2023). The vast majority of psychologists worked on the assumption that autistic people lack a theory of mind (Baron-Cohen et al., 1985; Gernsbacher & Yergeau, 2019).

Moreover, most of the neurodiversity studies are centred around autism-related issues (Rosqvist et al., 2020), and regrettably, there are not many inquiries about ADHD, if at all. To further highlight the difference between autistic and ADHD communities, the histories of ADHD and autism differed vastly in medical diagnosis and response (Singh, 2002; Waltz, 2023). Before autism, the people we would classify as autistic today would be considered until the 1970s as “childhood schizophrenics”; they were placed in mental hospitals and given repeated electric shock treatments. On the other hand, patients who were diagnosed with ADHD were mostly children, and no mental institutionalisation was necessary; they had an intimate association with the pharmacological drug methylphenidate (also called Ritalin) that could treat ADHD with high surgical precision and has had positive outcomes on school performance (Jangmo et al., 2019) and reducing risk of depression , changing the ways people relate to ADHD (Singh, 2002).

The neurodiversity paradigm has predominantly operated under the logic associated with autism advocacy, presenting a distinct stance from the pathology paradigm. However, applying this framework to ADHD reveals complexities that challenge a direct translation of the autism-centric approach of the neurodiversity paradigm. Unlike the autism rights movement, where the eradication of the condition is often resisted, many individuals with ADHD find essential support and benefit from pharmacological interventions. Medications like Ritalin are not viewed universally as efforts to 'cure' ADHD but rather as tools to manage specific symptoms that those with ADHD may find debilitating or obstructive in their daily lives.

For example, Kafer provides such a framework called the political/relational model of disability, where she recognises "the possibility of simultaneously desiring to be cured of chronic pain and to be identified and allied with disabled people" (Kafer, 2013, p. 6).

In Doyle's (2020) biopsychosocial model, she recognises that there are clear biological markers of psychological difference that result from social environments, e.g., educational and occupational norms such as "social demands, sedentary lifestyles, literacy dependency and automation of gadgets" (Doyle, 2020, pp. 113–114). It suggests how we medically label different neurocognitions as a disorder is contingent on changing societal norms and expectations of work life, i.e., with the ubiquitous use of smart devices and smart auto-correction algorithms, dyslexia might as well 'disappear' as a disorder (Doyle & McDowall, 2021).

In Carter’s extension of Barnes’ (2016) minority bodies toward a minority mind for mental disability, we can synthesise both naturalistic and constructivist accounts of mental disability and conclude it is value-neutral: through self-evaluation, disability can genuinely frustrate life plans while also being instrumentally good and valuable (Carter, 2023).

In conclusion, the /r/ADHD community has endured many hardships: the inaccurate portrayal of ADHD in media reports (Barkley, 2002), harassment of other ADHD communities caused by disagreements, and subsequently, the invalidation and denial of their experiences. While respecting the self-advocacy of /r/ADHD, people with ADHD must ultimately decide what is best for themselves. From the critical reflections, they seem more aligned with the neurodiversity movement than they tend to believe.

Conclusion

This chapter has laid the groundwork for understanding the complex interplay between neurodiversity and ADHD. We have seen how the disability rights movement and critical disability studies challenge the traditional medical model of disability, advocating for a more inclusive understanding that situates disability within social and environmental contexts. The emergence of the neurodiversity movement, particularly within the realm of autism, has further expanded this conversation, introducing a paradigm where neurological differences like ADHD are seen as natural variations rather than deficiencies.

However, a synthesis between the pathology and neurodiversity paradigm is preferable in the context of ADHD due to the appreciation of medicalisation. This reconceptualisation of neurodiversity and its relationship with ADHD is crucial for framing the following discussions on participatory design and technology development tailored to the needs of neurodivergent individuals.

Chapter 2 – The Intersection of Technology, Design and Neurodiversity

“*All technology is assistive technology.*”

(Hendren, 2020)

Chapter 2 investigates the intricate connections between technology, design and neurodiversity. The chapter is structured around two primary sections: "Science and Technology: Designing for Whom?" and "Participatory Design for Neuro-Inclusive Technologies." The first section critically examines how technology and society influence each other, exploring the role of science and technology in shaping societal norms and vice versa. It delves into how design practices, particularly in the field of HCI, have historically marginalised neurodivergent individuals like those with ADHD. The second section builds on these insights to advocate for agonistic PD as a methodology for HCI research, offering a more inclusive and practical approach to technology development.

Science and Technology: Designing for Whom?

Feminist STS and Technological Artefacts

In the 1970s, STS was born from a combination of the history of science, sociology of science, and philosophy of science. The decade witnessed an increasing recognition that science and technology were not isolated endeavours. Instead, they were deeply intertwined with societal structures, politics, economics, and culture. As Jasanoff (2004) noted, science and technology were co-produced within the societal fabric, challenging the traditional idea of science as a purely objective enterprise. Co-production is thus “the proposition that the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it” (Jasanoff, 2004, p. 2). Early STS scholars were keen on demystifying science. They wanted to showcase that behind the façade of objectivity and neutrality, scientific practice was deeply embedded within social contexts. This realisation changed how society viewed scientific authority and expertise, casting doubt on previously unchallenged narratives.

One of the foundational concepts in STS is the Social Construction of Technology (SCOT), proposed by Pinch and Bijker (1984). SCOT posits that technological artefacts are not mere outcomes of linear scientific progress but are shaped by various social, cultural, and political influences. According to SCOT, the development of any technology undergoes various "interpretative flexibility," where different social groups perceive and interpret the technology differently. For example, in its nascent stages, the bicycle was seen differently by male athletes, women, and urban labourers. These diverse interpretations led to various designs and modifications, each catering to a specific group's needs and preferences. Only when a specific design stabilised across social groups, a process termed "closure," was the bicycle standardised in its modern form. This perspective underscores that technological advancements are not deterministic. Instead, they evolve through negotiations, controversies, and alignments among various social groups.

Winner (1980) further entrenched the idea that technologies are not neutral, arguing that technological artefacts could have inherent political qualities. For instance, Robert Moses's low-hanging overpasses in New York were designed to prevent buses (and, by extension, citizens from lower socio-economic classes) from accessing certain recreational areas, reflecting and enforcing racial and economic segregation. This case elucidates how infrastructure and design can encode and perpetuate societal biases and power dynamics. In Winner’s view, technologies are not merely shaped by society but actively shape societal structures in return. Moreover, Latour (1992) further emphasized this point, proposing the concept of “sociotechnical ensembles,” where technology and society are seen as inextricably linked. Engineers, by virtue of their work, participate in the social construction of reality, influencing how people interact with each other and their environment. Through the principles and practices embedded within their designs, engineers can promote certain social values and potentially marginalize others (Latour, 1992). Scientists and engineers, through their design choices, engage in shaping societal structures, whether intentionally or not.

It is essential to address why focusing on technological artefacts, rather than on an abstract notion of big ‘T’ technology, is critical. Technology with capital ‘T’ often abstracts and “reduces technological artefacts to nontechnological elements such as organization and the will to power” (Verbeek, 2005). In similar fashion, what I mean by ‘technology’ or ‘technology use’ is the tangible interactions with modern, science-based technological devices that individuals use daily (e.g., computers, smartphones, hairdryers, etc.). These interactions shape human experiences and social realities and deserve a more nuanced understanding that reveals how technology is used, perceived, and experienced by different groups, including those marginalised or overlooked in mainstream technology design. They possess a form of agency; they are not neutral tools but actively mediate human experiences and perceptions (Latour, 2005; Verbeek, 2005). By focusing on the ‘things themselves’, this thesis grounds itself in the material reality of technology, avoiding the abstraction and decontextualization that often accompany discussions of Technology with a capital ‘T’.

Women and other marginalised genders have faced systemic exclusion from science and technology fields. This exclusion was not just in terms of participation but also in terms of the very knowledge that these fields produced. As Harding (1986) posited, traditional science, cloaked in claims of objectivity, often bore the invisible marks of its predominantly male Western creators. Feminist scholars of STS saw a need to critique and deconstruct these claims. They argued that science and technology were not neutral but were influenced by gendered assumptions. This fusion of feminist thought with STS laid the foundation for what we now know as feminist technoscience.

Donna Haraway, a pivotal figure in feminist technoscience, introduced the concept of "situated knowledges" (Haraway, 2016). She argued against the notion of an "all-seeing, all-knowing" objective science, suggesting that all knowledge is local and specific. By accepting the partiality of all perspectives, including those from marginalised standpoints, a more enriched and holistic understanding of the world can emerge. Moreover, Haraway's (2000) cyborg manifesto further illustrated how boundaries between human-machine, male-female, and nature-culture are increasingly blurred. This "cyborg" vision was not a bleak dystopian outlook but a call to embrace hybridities and challenge rigid binaries and structures.

Scholars in feminist technoscience were keen to unearth how gender biases were embedded in various technologies. Wajcman (2004) argued that technology is both a source and a consequence of gender relations. For instance, the design of early voice-recognition systems was tailored to male voices, effectively marginalising female users. Similarly, safety equipment, from seat belts to space suits, often defaulted to male body norms, posing potential risks to female users (Weber, 1997). Such analyses highlight the repercussions of a male-centric worldview in technology design and underline the urgency for more inclusive design practices.

While gender was a central pillar in feminist technoscience, the discipline was not myopic. Scholars started addressing how other dimensions of identity, such as race, class, and sexuality, intersect with gender to shape our interactions with technology. Ruha Benjamin's (2023) work on "discriminatory design" illuminates how technologies, especially algorithms, can perpetuate racial biases. Facial recognition technologies that misidentify people of certain ethnicities or skin tones or health algorithms that disadvantage particular racial groups underscore the need for broader inclusivity in design. Moreover, another critique from the feminist technoscience perspective is the "digital divide," a term that highlights disparities in access to technologies based on socioeconomic status. Scholars like Eubanks (2018) have pointed out how marginalised communities, especially those of lower socioeconomic status, often lack access to essential digital resources, limiting their ability to participate in an increasingly digitalised society.

Furthermore, a critical objective of feminist technoscience was not just critique but change. Efforts were geared towards highlighting biases and fostering environments where marginalised groups could actively participate in knowledge creation and technology design. Such endeavours bore fruit. There was a push for more representation in scientific committees, more inclusive practices in tech companies, and grassroots movements that sought to democratise tech creation (Faulkner, 2001).

Crips and Feminists: The Neurodiversity Case

STS is perpetually evolving, seeking interdisciplinary connections to expand its horizons. One of the more recent alliances has been the interweaving of crip theory and feminist technoscience. Drawing on Hamraie & Fritsch’s (2019) notion of crip technoscience, this section delves into the intricate ways in which crip and feminist technoscience theories can be brought into a cohesive framework, illuminating the relevancy of neurodiversity and its implications on the design of technologies.

Crip technoscience offers a novel perspective, emphasising a more inclusive vision of technological development. By weaving together crip theory's advocacy for disability rights and recognition with the feminist technoscience emphasis on gender, intersectionality, and power dynamics in the domain of science and technology, crip technoscience seeks to dismantle the existing hierarchies and biases present in conventional technoscientific practices. It aims to create spaces where marginalised voices, especially those of disabled individuals, are not merely acknowledged but actively shape the direction of technological advancements.

The reason for bringing these two frameworks together is the limitations seen in both crip theory and feminist technoscience and to “explore their generative frictions” (Hamraie & Fritsch, 2019, p. 2). Crip theorists have had limited engagement with the *critical* concept of technoscience, and as such, has “yielded an ahistorical position that science, technology, and medicine are anathema to crip world-remaking, ignoring disabled peoples’ ongoing, creative, and open-ended appropriations of science, technology, and medicine” (Hamraie & Fritsch, 2019, p. 3). In other words, attention should be brought to the skills, wisdom, and resources neurodivergent people already utilise for materialising, navigating, and altering inaccessible worlds.

Haraway’s (2000) cyborg theory has massively influenced feminist technoscience, rejecting rigid boundaries between humans and machines. However, many disability scholars critiqued the cyborg metaphor. Kafer noted the absence of “any kind of critical engagement with disability” (Kafer, 2013, p. 216), saying that “disabled bodies are simply presented as exemplary, and self-evident, cyborgs, requiring neither analysis nor critique” (Kafer, 2013, p. 216). Weise (2018) argues that her manifesto erased disabled people and appropriated the aesthetic of disability. Without critically examining disability, the risk exists that “cyborg” and “physically disabled person” are being conflated, as she noted that “appellations (such as ‘monster’ or ‘creature’) have historically been applied to [disabled, deaf, and neurodivergent women]” (Weise, 2018), reinforcing ideas about disability as lack and disqualification (Bailey, 2012).

Within this framework, neurodiversity emerges as a salient case. Neurodivergent individuals, particularly those with ADHD, encounter assistive technologies that appear supportive in intent but are inherently discriminatory in design and function. Many technologies are entrenched in neurotypical bias and technoableism (Shew, 2020; Spiel et al., 2022).

Moreover, Spiel et al. (2022) found a preponderance of technologies that excluded people with ADHD from knowledge production of the technologies that were supposed to help them. For those that follow the user-centred design to involve users throughout the design process, none included ADHD participants in pre or post-experiments, only informed by discussions and interviews of parents, teachers or medical experts on ADHD. This exclusion, in turn, leads to technologies "primarily embody[ing] neurotypical expectations rather than neurodivergent needs and desires" (Spiel et al., 2022, p. 12). A fundamental lack of active involvement and privileging perspectives that uphold neurotypical norms resulted in technological artefacts amplifying existing power dimensions detrimental to neurodivergent individuals.

The issues mentioned above underscore the significance of the four commitments of crip technoscience:

1. **"Crip technoscience centres the work of disabled people as knowers and makers"** (Hamraie & Fritsch, 2019, p. 7).

By embracing this commitment, I acknowledge that for technology to cater to neurodivergent individuals genuinely, it is imperative to involve them actively in the design, development, and evaluation processes, ensuring that the end products resonate with their actual needs and challenges rather than being reflections of neurotypical assumptions. Rather than treating people with ADHD as passive recipients of technologies, it entails a design process where their experiences, knowledge, and creativity drive technological creation and innovation. Engaging with them in ideation, testing, and feedback would lead to more effective, tailored and empathetic tools that truly address their unique needs.

2. **“Crip technoscience is committed to access as friction”** (Hamraie & Fritsch, 2019, p. 10).

“Access” in this sentence moves beyond mere entrance or usage; it is about ongoing engagement, interaction, and adaptation (Fritsch, 2016). Access as friction acknowledges that accessibility is not always about smoothness or ease but may involve challenging, questioning, and reshaping structures and norms. Moreover, it means not just creating tools that people with ADHD can use but also tools they can adapt, question, and critique. The technologies should be flexible enough to be moulded according to their evolving needs and challenges, fostering a sense of ownership and empowerment.

3. “**Crip technoscience is committed to interdependence as political technology”** (Hamraie & Fritsch, 2019, p. 12).

Interdependence is positioned as a “technoscientific phenomenon, the waving of relation circuits between bodies, environments, and tools to create non-innocent, frictional access” (Hamraie & Fritsch, 2019, p. 12). It rejects the goal of technoscience to encourage *independence* “in the sense of isolation, total responsibility for one’s own needs, and total avoidance of inconvenience to non-disabled people” (Shew, 2020, p. 46) but rather about the right to a public life outside of institutions. It recognises that culture, community, and knower-maker practices are political technologies. Designing for ADHD means recognising that technology is an ambivalent and continuous effort to build better and more inclusive worlds, and that the ADHD community is a central aspect of collective access.

4. **“Crip technoscience is committed to disability justice”** (Hamraie & Fritsch, 2019, p. 16).

This commitment aligns with the disability justice movement's critique of mainstream disability rights concepts and focuses on intersectionality, collective liberation and wholeness. Clare's (2017) notion of *wholeness* challenges the binary of broken/whole. It celebrates disabled bodies as they are while also acknowledging the desire to adapt and redefine one's relationship with technology and the body. Furthermore, it means developing technologies that do not perceive ADHD as something to 'fix' or 'overcome'. Instead, the design should be grounded in a respect for neurodiversity, embracing ADHD as a unique way of being. At the same time, it should empower those with ADHD to adapt and interact with technologies in ways that resonate with their lived experiences and aspirations.

To realise these commitments in the context of assistive technologies for ADHD, a paradigmatic shift is essential. The conceptualisation of such technologies should stem from the lived experiences of ADHD individuals, ensuring a holistic understanding of their challenges. Designers and researchers must engage in participatory workshops with neurodivergent individuals, creating a collaborative atmosphere where their voices lead the design trajectory (Spiel et al., 2022). It necessitates the inclusion of neurodivergent individuals in research teams, advisory panels, and decision-making bodies. The technological design methodologies must evolve from a top-down approach to a more bottom-up, collaborative co-design model.

Participatory Design for Neuro-Inclusive Technologies

Democratising Innovation: From Democracy at Work to Agonistic Public Spaces

PD is a methodology that emphasises user involvement in the design process. It tries to understand the tacit knowledge of users through designing, i.e., creating technological artefacts while simultaneously “envision, shape, and transcend [the design process] in ways [users] find it to be positive” (Spinuzzi, 2005, p. 164). Originating from the 1970s Scandinavian labour movements, PD aimed to democratise the design of workplace IT systems, giving workers a voice in their tools (Ehn, 1988).

Contemporary uses of PD have expanded beyond its labour roots to fields like education, healthcare, urban planning, and information technologies, emphasising collaboration, empowerment, and democratisation in design processes. Examples include the co-design of digital health tools with patients and clinicians (Sanders & Stappers, 2008) and the involvement of students and teachers in designing educational software and environments (Druin, 2002).

PD embodies core values that deeply resonate with the commitments of crip technoscience, effectively bridging the insights of these frameworks with actionable practices in design. PD's core lies the commitment to democratisation, collaboration, and reflexivity. The democratisation of design through PD insists on the redistribution of power in the design process, advocating for end-user involvement that challenges the conventional, top-down decision-making paradigms that often neglect the voices of those most affected by design outcomes (Schuler & Namioka, 1993).

In the previous section, we have seen how crip technoscience underscores the importance of inclusivity and equity in scientific and technological endeavours. PD aligns with these approaches by recognising the varied experience and expertise that individuals bring to the table, therefore pushing against neuronormative assumptions embedded within technological artefacts. The value of inclusivity ensures that diverse perspectives, particularly those of marginalised groups (Björgvinsson et al., 2012), are not only heard but are integral to the design process.

Moreover, the collaborative nature of PD insists on a collective co-creation process, where stakeholders work side by side, emphasising partnership and shared ownership (Spinuzzi, 2005). This co-creation is pivotal for crip technoscience, as it seeks to dismantle hierarchical structures of knowledge production and embraces diversity by creating technology that reflects and accommodates a spectrum of abilities. This accommodation means that the research should truly include the participants, as Spiel et al. noticed that, even though the research papers claim to follow principles of user-centred design, “projects rarely include people with ADHD as the core stakeholders and end users in an active role that directly contributes to the development process” (Spiel et al., 2022, p. 8).

Finally, reflexivity in PD involves a continuous self-reflection of the design process (Spinuzzi, 2005). It invites practitioners to constantly reflect on their methods, assumptions, and the potential impact of their design decisions. This cyclical process aligns with feminist STS’s call for reflexivity in scientific practice, acknowledging that technology is socially constructed and imbued with certain societal values.

While PD aims to democratise innovation, it often operates within predefined groups and specific design projects, leaving a significant gap in addressing the broader context of public spaces and diverse social groups. One of the critiques of traditional PD approaches comes from Björgvinsson et al. (2012), who proposed an *agonistic participatory design* with democracy as a core value. Agonistic is framed as “a polyphony of voices and mutually vigorous but tolerant disputes among groups united by passionate engagement” (Björgvinsson et al., 2012, p. 129) and is a political theory often associated with thinkers like Chantal Mouffe.

In Mouffe’s (2005) agonistic model of democracy (agonistic pluralism), she argues for a vibrant clash of democratic political positions, where diverse and conflicting viewpoints are seen as essential to the health of a democratic society. This approach emphasises working with marginalised social movements, a stark contrast to most contemporary PD literature's predominantly technical, expert-oriented, and market-driven nature. Agonistic PD aligns closely with the earlier Scandinavian PD model (Ehn, 1988), focusing on democracy at work and addressing hegemonic structures within organizations. This model aimed to transform antagonistic struggles within companies into passionate, agonistic design and innovation strategies, emphasizing worker empowerment and skill enhancement, particularly in collaboration with local trade unions.

However, the challenges of agonistic PD evolve when the context shifts from the workplace to public spaces. The democratic challenge in public spaces is about enabling publics to emerge around 'matters of concern' (Dewey, 2016; Latour, 2005). Publics “are a movement away from design projects and towards processes and strategies of aligning different contexts and their representatives” (Björgvinsson et al., 2012, p. 127). This perspective necessitates the creation of public agonistic spaces where long-term relationships can be fostered through activities of "thinging" and "infrastructuring" in the Latourian sense that things and infrastructures are ongoing processes of assembling, negotiating, and interacting with objects or entities. Case in point are the living labs initiatives in Björ’vinsson et al’s paper. These spaces should facilitate artful integration and foster the emergence of public discourse around key issues.

Agonistic Design Spaces for HCI Research

Spiel et al. (2022) noted that, while the prospects within HCI research look bleak on including ADHD participants, they nonetheless analysed several PD and co-design approaches that were deemed successful. Eriksson et al. (2017) conducted future workshops and lo-fi prototyping sessions with ADHD students, focusing on their conceptions of time. This project aims to develop tools that align with individual perceptions of time, addressing the characteristic difficulties with time processing and perception often experienced by those with ADHD (Birth, 2017). Similarly, Zuckerman et al. (2015) involved ADHD children in developing Tangiplan, a tool that aids in planning and executing daily tasks. This project stood out for giving agency to children with ADHD, allowing them to define routines, set goals, and decide on the placement of Tangiplan hourglass reminders.

However, how do we make sense of the agonistic PD intended for marginalised groups in agonistic public space while discussing traditional PD processes that HCI researchers use? I propose a hybrid framework that integrates agonistic principles into traditional PD that harnesses the strengths of both, ensuring that the design process is not only inclusive and responsive to the needs of neurodivergent people but also structured and effective in achieving tangible outcomes. Instead of moving entirely from traditional workplace PD to agonistic public spaces, I recognise both views' respective limitations and synthesise them into *agonistic design spaces.*

Integrating Agonistic Principles. Integrating agonistic principles into traditional PD involves an active effort to involve neurodivergent individuals and communities in the design process. This approach challenges the conventional PD methods that often operate within rigid organisational structures, typically bound by predefined project stages and goals.

Fostering Democratic Dialog. A key aspect of this hybrid approach is fostering democratic dialogue within the design process. It is essential to create spaces where all participants, especially those from marginalised or neurodivergent backgrounds, can freely express their views and have them genuinely considered. This democratic dialogue extends beyond the practical aspects of technology design and delves into the social, ethical, and political dimensions. Aligning with the agonistic approach’s emphasis on broader societal issues, this dialogue encourages a more holistic view of technology design, considering its impact on individuals, communities, and society.

Collaborative Problem-Solving. Conflicting views and diverse perspectives are opportunities for deeper understanding and innovation rather than obstacles. The approach encourages collaborative problem-solving, where people with ADHD, designers, and other stakeholders work together to identify challenges and develop solutions. This collaborative process turns differences into drivers for creative solutions, fostering an environment where diverse ideas are valued and explored. Co-design workshops are instrumental in this process, providing a platform for collective ideation and development.

Reflecting on the Process. Lastly, continual reflection on the PD process is crucial in this hybrid approach. It involves assessing whether the design process is inclusive, fair, and effective in meeting the goals of the neurodivergent participants. Reflection also includes examining the elements that might inhibit full participation and modifying these to enhance inclusivity and democratic engagement.

In conclusion, this hybrid approach called agonistic design space, which melds the strengths of traditional PD with the inclusive and democratic ethos of agonistic PD, offers a promising framework for developing assistive technologies for people with ADHD.

Conclusion

Understanding the relationship between neurodiversity, technology, and design requires an intricate dance between various interdisciplinary perspectives. STS lays the groundwork by presenting technology as co-produced with society; technology is value-laden. Feminist technoscience, with its emphasis on situated knowledge, highlights the importance of acknowledging and addressing technological biases. Integrating crip theory into feminist technoscience presents an avenue to view ADHD not as a deficit but as a unique standpoint, underscoring the importance of PD in creating neuro-inclusive technologies.

By conflating these theories, it becomes clear that a participatory approach to technology design, rooted in the principles of crip technoscience, can pave the way for genuinely inclusive technological solutions that address the needs and desires of those with ADHD. By extending Björgvinsson et al.'s agonistic PD intended for marginalised social movements towards a more traditional setting of PD, it is possible to reconceptualise agnostic PD practices for HCI research.

Chapter 3 – Case Study: Co-Design ADHD Technology

> “*Designing technology is designing humanity.*”
>
> (Verbeek, 2009)

Chapter 3, "Case Study: Co-Design ADHD Technology," is dedicated to exploring the practical application of the theories and concepts discussed in the previous chapters. This chapter revolves around an empirical case study – a PD workshop involving students with ADHD. The aim is to uncover the key benefits and challenges of employing a PD approach in developing neuro-inclusive technologies. The workshop's methodology, results, and discussion provide real-world insights into how PD can be effectively implemented and the impact it can have on technology development for neurodivergent individuals.

Methodology

Design Philosophy – This case study is centred on a PD workshop tailored to emphasise technology development's creative and ideation phases. In alignment with the PD principles (Spinuzzi, 2005), the workshop was structured to facilitate collaborative brainstorming, conceptualisation, and early-stage prototype envisioning ADHD-friendly technology in an agonistic design space.

The PD workshop did not aim to produce a functional technological artefact, as is normally expected from PD research. Instead, the focus was placed on the generative activities that foster creative thinking and allow for exploring alternative technological designs and solutions. This approach recognises that the value of PD lies not only in the end product but in the process itself, which can gain valuable insights into user needs and desires. While creating a tangible product was outside this thesis’ scope, the workshop's outcomes are expected to contribute significantly to the HCI and technology development field.

Positionality – Positionality refers to the stance or positioning of the researcher concerning the social and political context of the study – the intersection of the researcher's personal background, culture, and socio-political identity with the research topic. Acknowledging positionality is crucial because it influences all aspects of the research process, from formulating questions to interpreting data.

As a researcher with a late diagnosis of ADHD at the age of 26 and currently a student, my positionality brings both unique insights and potential biases to the study. This lived experience dissolves the traditional split between subjects and objects, allowing for a more nuanced understanding that only an insider can provide. My journey through academia with ADHD not only gives a personal understanding of the challenges and nuances of neurodiversity but also provides an empathetic lens through which to view the participants' interactions with technology. This standpoint enriches the research with a depth of empathy and authenticity that might be less accessible to someone without similar experiences.

Standpoint theory posits that knowledge is situated and that marginalised groups can provide unique insights due to their distinct perspectives (Hartsock, 2019). As a researcher from the neurodiverse community, my perspective does not simply add another view but is fundamental to a holistic understanding of the topic area. It allows for the emergence of themes that may not be recognised by those not living with ADHD, and it provides a critical lens to question normative assumptions made in the design and use of technology for individuals with ADHD.

In this study, my position as both researcher and member of the ADHD community offers a dual vantage point: it serves as a bridge between the lived experiences of ADHD and the academic pursuit of knowledge. By blending these perspectives, the research aims to transcend the binaries of traditional scholarship and embrace a more integrated approach to knowledge production, one that honours the voices and experiences of those it seeks to understand and support

Participant Selection – The PD session is conducted with 17 students aged between 18 and 28 who either have a diagnosis or believe themselves to have ADHD. The choice to focus only on students is substantiated by the fact that most ADHD technology research centres on children (Spiel et al., 2022). Students represent intriguing demographics as they transition between the structured environments typical in childhood and the more self-directed contexts encountered in adulthood. This shift suggests that the role and requirements of technology designed to support them might also undergo drastic changes (Spiel et al., 2022).

Concentrating on the student population, this research taps into a largely unexplored area within the literature. Students with ADHD often face unique challenges as they navigate academic environments that demand increasing levels of self-regulation and personal management – skills that the symptoms of ADHD can compromise. The design and utility of technology to assist in this transition has significant potential for enhancing academic and personal success. Furthermore, exploring technology use within this age group provides a unique opportunity to understand how ADHD manifests in semi-structured environments and what technological interventions can be most beneficial.

Moreover, it is essential to note that participants were selected based on their experiences and challenges related to ADHD rather than exclusively requiring an official diagnosis of ADHD. The justification for including participants without official diagnoses and relying on self-diagnosis is grounded in the understanding that neurodiversity exists along a continuum, and individuals may face attentional challenges without seeking or receiving a formal diagnosis. Students are chosen based on the personal affinity they have with ADHD. Moreover, many people prefer not to be diagnosed due to the lingering stigma of mental disorders (Barkley, 2002; McIntosh et al., 2022).

Procedures – The duration of the session is 2,5 hours and was divided into four sections:

- An introduction to the research topic. I introduced the participants to the concept of neurodiversity and explained the goal of the research;
- A discussion of the lived experiences of ADHD. By asking them how they have experienced their ADHD (whether it be pre, post, or no diagnosis) and how they have used technology to alleviate some of the symptoms, I attempt to get a discussion going to hear the experience of living with ADHD as well as what kinds of technologies (and techniques) they were using.
- A short brainstorming and ideation phase, where participants broke into several groups. By asking them what sort of technology they would like to see in the future to help them in their life goals, participants had to brainstorm and think of a technological artefact that did not exist. They were given paper, pens, and small trinkets to conceptualise and design their initial drafts or prototypes.
- A short presentation of each group's brainstorm and design session. Each group had to present a design concept or lo-fi technology prototype that could assist them during the presentation to visualise the issue and technology at hand.

Furthermore, the session is organised such that it ensures the needs of neurodivergent participants through the entire research, from pre-, during, to post-study stages (Szulc, 2022). Before the workshop, the online form to which participants could sign up provided them with all the necessary information in advance, such as the time and structure of the workshop and the topic, intention, and description of the researcher. The text and paragraphs have been formatted to supposedly neurodivergent-friendly typography[3]. A follow-up mail was provided the day prior, adding more information and setting the stage for the workshop (instructions on how to enter the building, asking them to think about what kind of technologies they are using, catering information, etc.).

During the workshop, it was effectively communicated that the session was a safe and inclusive space; participants were allowed to lose attention during prolonged monologues or dialogues or could interrupt the session for any issues. They understood the session would be recorded and consented to audio-visual data gathering. Afterwards, the participants were interested in the research and the resources I had used and wanted to be updated about the research work. By seeing participants as genuinely inclusive, they are fully debriefed about the findings of the research afterwards (Szulc, 2022).

Data Collection and Analysis Methods – For the examination and interpretation of data garnered from the PD workshop session, this case study employs a thematic analysis (TA) by Braun & Clarke (2006). This methodological approach was selected for its robustness and flexibility in identifying, analysing, and reporting patterns within the data. Rather than approaching the data inductively, this analysis is more theoretical, driven by the conceptual interests and the theoretical framework underpinning the study – namely, a constructionist epistemology drawn from feminist STS. In line with this constructionist approach, the TA is attuned to the underlying ideas and assumptions that shape the data, meaning that the focus is not merely on the surface meaning of the data (the semantic content). Instead, the underlying ideas from the articulated experiences are essential.

The data was collected by audio recording the workshop session, which was then meticulously transcribed. The manual transcription process not only ensured the accuracy of the data but also afforded an initial in-depth engagement with the content. The subsequent

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[3] Bionic Reading. https://bionic-reading.com/

analytical process involved a recursive engagement with the data, moving back and forth between the entire data set, the coded data extracts, and the themes' analysis.

Furthermore, each data item has been given equal attention in the coding process. By collating all relevant extracts, many themes have been identified due to the heterogeneity of the session. These themes have been collated into broader themes, making them sub-themes or main themes. They have been reviewed as such that they were not solely a theme to a particular part of the session but interrelated with the workshop and study as a whole.

Results

In this section, I present the findings of the TA of the data collected during the PD workshop. Three key themes related to the research question and the theoretical framework emerged.

Theme 1: Collaborative Understanding as Design Catalyst

Collaboration emerged as a central aspect of the workshop session. Many participants could relate to each other’s struggles, felt seen and understood, and exchanged knowledge of their personal technology use and other strategies, techniques, and methods to navigate everyday life as a neurodivergent.

There were many accounts of other participants able to confirm and relate to the same struggles they experienced during discussions of living and experiencing ADHD. One participant said: “The session felt very validating. I have always felt like every time I tell a person that I have been diagnosed with ADHD, they would reply with: ‘But you function so well’! [...] Now, I have realized that the things that I experience are normal.”

A key topic multiple participants experienced was a so-called ‘barrier’ or ‘tipping point’, a term describing a time when participants were unable to perform daily, social, or educational activities and were mentally or physically burdened. Many participants shared their experience that they got the diagnosis after reaching this barrier when they failed school or were underperforming. Moreover, one participant knew about the ADHD diagnosis since childhood and “tried [functioning] without medication, but I could not deal with it anymore”, with ‘it’ referring to the amassment of social, educational, and work-related responsibilities typically found in student life.

Moreover, the discussions about the ADHD experience enriched the session's PD part. Many topics and themes were identified during the discussions of the ADHD experience and would serve as a source of creativity during the ideation phase. The topics included sleeping issues and issues with the circadian rhythm, technologies that work or do not work for them, and motivation issues. The discussions mainly revolved around the negative aspects of ADHD and followed from the discussion part where, through the tipping point, they were not able to pursue their personal or academic goals.

One of the standout concepts presented was the "ADHD Mode" for digital devices. This functionality aims to mitigate the overstimulation caused by the barrage of notifications that are all too common in today's technology. By streamlining the user interface to eliminate unnecessary alerts, this mode addresses the cognitive overload and distraction that can arise from persistent notifications. The design reflects a thoughtful consideration of how attention is managed and often fragmented by the devices integral to modern life. Such a feature indicates a technology that does not compete for attention but respects the user's focus, providing a calmer digital environment conducive to the needs of those with ADHD.

Another group offered an equally innovative solution tailored to address the challenge of time perception—a smartwatch that utilizes vibrations to provide temporal awareness. Recognising that many individuals with ADHD struggle with time management, resulting in missed appointments or difficulty taking necessary breaks, this concept reimagines the smartwatch as a tactile reminder system. By offering customizable vibrations—whether to mark the passage of each hour or to signal predetermined intervals—this device serves as a discreet yet effective tool for time management.

Discussion

The emergent theme of collaborative understanding as a design catalyst reiterates the foundational principles of technoscience, wherein technology is not just a tool for solving problems but also an integral part of how individuals with ADHD navigate their world. The PD workshop provided a platform for students with ADHD to actively engage in the design process, using their unique experiences and knowledge to inform the development of potential technological solutions. This approach confirmed the value of their experiential knowledge, with participants utilising and modifying existing technologies such as timers, smartwatches, and calendars to fit their specific needs.

By bringing individuals with ADHD together, the workshop facilitated an environment where the participants owned the definition of 'problems' and 'solutions' rather than imposed by external medical experts. This participant-led approach led to a rich diversity of ideas and topics that originated directly from lived experiences, signalling many insights that can be accessed when design processes are genuinely participatory. Furthermore, through the lens of interdependence as political technology, participants, despite the majority having never met each other, were able to form connections and kinship through their practices and networks of knowledge and how they organise their relations between bodies, technologies, and environments.

Despite these strengths, the workshop's structure presented certain limitations. The single-session format meant that the ideation phase was constrained by time, potentially limiting the depth and breadth of exploration possible within the collaborative setting. Moreover, the absence of tangible design aids, such as props or wireframes, may have restricted participants' ability to visualise and flesh out their concepts fully. Most ideas were sketched on paper, which, while valuable, does not afford the same level of engagement or concreteness as a prototype or interactive model might have offered.

These limitations suggest avenues for further research and development in PD methodologies, particularly when engaging neurodivergent populations. Future workshops could benefit from a more extended format that allows for iterative development and refinement of ideas. Including tangible design tools could also enhance the concreteness and interactivity of the ideation process, providing a more affluent foundation for developing practical and innovative technology solutions tailored to the ADHD community.

Theme 2: Assistive Autonomy

This theme emerged to reflect the dual role of technology in assisting while fostering autonomy by enabling users to customise their technological experience according to their personal needs and preferences.

Sub-theme 1: Smartness of Technology

A significant tension surfaced during the coding process within this subtheme: the delicate balance between simplicity and customisability. Participants exhibit a broad spectrum of needs and preferences; therefore, customisable features in technology are vital. This customization allows tailoring the interface to match specific user requirements, accommodating diverse attentional patterns and cognitive styles. Participants emphasised technology's need to adapt to their unique needs, offering a personalised experience that supports their workflow, study habits, or daily routines.

However, this customisation mandate came with an inherent challenge: the technology must remain simple and intuitive, preventing users from becoming overwhelmed or, conversely, understimulated. The tension between simplicity and customizability was noticeable, requiring careful consideration during the design phase. Too much complexity could lead to confusion and frustration, while oversimplification might render the technology insufficiently adaptable, failing to meet individual needs effectively. Participants emphasised the need for intuitive interfaces that allowed them to tweak settings and functionalities easily, striking a balance that addressed their specific requirements without overwhelming them with unnecessary complexity.

Furthermore, a key insight from the analysis highlighted the interactional nature of technology that appears from or fades into the background of the user's experience. Technology should ideally remain latent, surfacing only when necessary and seamlessly integrating into their daily lives. The notion emerged from the coding where participants expressed a lack of intrinsic motivation to engage with tasks and used strategies like employing a body double or participating in video calls with friends to enhance focus and productivity. In this context, technology served as a support system, intervening when the participant found initiating or sustaining tasks independently challenging.

Sub-theme 2: Technology as Delegation

This subtheme encapsulates the role of technology in augmenting cognitive processes and alleviating the cognitive load associated with daily tasks.

One aspect of this subtheme is the desire for simplified technologies. Participants consistently expressed the need for technologies that simplify their decision-making processes. They emphasised the potential for technology to reduce the cognitive burden of constant decision-making and minimise distractions. As one participant articulated, “There are so many apps out there, it is overwhelming, [...] it disadvantages us who already have trouble making decisions”. This sentiment underscores the desire for technologies that streamline everyday tasks and minimise the mental effort required. Many existing technologies were mentioned: timers, noise-cancelling headphones for focus and concentration, and productivity applications for structure and organisation.

Moreover, participants frequently highlighted the role of technology as delegation. They envisioned technology as a tool for delegating cognitive responsibilities, effectively offloading cognitive load onto the technology. One participant spoke of the "Second Brain" as a concept from personal information management to describe the role of technology in augmenting memory functions. They viewed technology as an external cognitive aid that could store information, provide reminders, and assist decision-making processes. In this sense, technology extends their cognitive capacities, supporting and enhancing their ability to navigate daily life.

Discussion

The theme of assistive autonomy highlights technology's nuanced role in balancing assistance with self-determination for individuals with ADHD. The data illustrate that while participants are drawn to technologies that capture their attention through, e.g., visual appeal, the ultimate utility is found in systems that blend predetermined structures with customisable options. This reflects the crip technoscience commitment to interdependence as a political technology over the binary dependence and independence of technology. By acknowledging the importance of collaborative support systems, this theme emphasises the goal for people with ADHD is not to function in isolation but to have access to tools that facilitate their connection with others, enhancing their capacity to support themselves and participate in shared responsibilities.

Furthermore, when discussing the Smartness of Technology, it is essential to acknowledge that the desired intuitiveness and the ability for technology to recede in the background may indeed require artificial intelligence (AI) systems. AI systems, which can adapt to and predict individual needs, hold significant promise for creating personalised, adaptive environments that cater to the varied experiences of those with ADHD. However, integrating AI into assistive technologies raises critical concerns regarding ethics and privacy.

The potential for AI to learn from and adapt to user behaviour must be balanced against the imperative to protect sensitive personal information and ensure that these systems do not become invasive, coercive, or technoableist (Shew, 2020).

Moreover, although the notion of technology as cognitive aid might appear to be a universal experience for people with ADHD, delegating tasks to technology is not just a convenience but a necessity for them. The theme of technology as delegation gains particular relevance in student life, where the ability to offload cognitive tasks onto technological tools can be crucial for academic success. It also highlights an interesting transition in the role of technology from childhood to adulthood for individuals with ADHD. Technology might be more prescriptive during childhood, often mediated by caregivers or educational/parental structures. In contrast, adulthood – particularly evident in student life – requires a more autonomous engagement with technology, which is self-directed and necessitates a higher level of self-regulation.

Reflecting on the generality of this sub-theme, it opens a broader inquiry into how these roles may evolve or remain consistent across different stages of adulthood, with implications for how technologies are disengaged and implemented to support individuals with ADHD throughout their lifespan.

Theme 3: Friction in Technology

The notion of friction in technology emerges from the data as a salient and multifaceted aspect of the participants' experiences. While the organisational structure is recognised as an indispensable component for navigating daily routines, its embodiment through technology can shift from supportive to controlling, creating a paradoxical tension.

Participants articulated their experiences with technology such as timers, smartwatches, and sunlight clocks, which are reappropriated to bring order to the temporal disarray that characterises ADHD. These devices provide scaffolding for managing time and energy – two dimensions often in flux for those with ADHD. However, the interplay between the user and the device is not without its dissonance. While objective in its function, a timer becomes a source of stress rather than relief when its relentless ticking becomes a metronome of mounting pressure. The smartwatch, designed to orient users within time, may be sidestepped or disengaged when its reminders feel like shackles rather than signposts.

This friction is further compounded by the necessity of engaging with technology due to societal and educational expectations of technology use. For the participants, their student identity necessitates the integration of laptops and smartphones into their academic and social activities. The design of these technologies, with their persistent nudges and notifications, starkly contrasts the participants' need for uncluttered cognitive space. One participant mentions the application WhatsApp to exemplify this tension; while it serves as an essential application for communication within their academic and social circles, its attention-grabbing notifications create an environment that is the opposite of concentration.

The participants' accounts reveal a nuanced spectrum of responses to this friction. Some resist technology's directive nature, finding ways to circumvent imposed structures, such as turning off a smartphone's Zen mode designed for focus. Others outright reject it, articulating a clear boundary against technologies that impose a regimented form of order, perceiving it not as guidance but as governance.

In essence, the friction arises not from the presence of technology itself but from the nature of its integration into the lives of individuals with ADHD. When the tools meant to provide structure become prescriptive to the point of being intrusive, they lose their supportive value. This theme captures the participants' search for autonomy over their technological environments – a quest for tools that are flexible companions rather than rigid overseers. It highlights the delicate balance between helpful structure and perceived control, which is critical for technology to serve the diverse needs of its ADHD users.

Discussion

I acknowledge the apparent challenges during the PD workshop in discussing this theme. At the surface level, friction might be perceived as an impediment to smooth design processes and user experience. However, from the point of view of crip technoscience, particularly its commitment to "access as friction", it is possible to reframe these challenges as opportunities to innovate and improve design solutions.

Rather than bypassing friction in the design process or user interaction, by closely examining them, we can uncover deep insights into the needs and preferences of neurodiverse individuals. This commitment invites us to question why particular friction moments arise and explore the underlying dynamics that shape these experiences. Instead of impulsively seeking to eliminate these frictions, a critical analysis provides a pathway to understand their origin and function, which can inform the development of more inclusive and adaptable technologies.

By embracing friction, more collaborative interactions between neurodivergent and neurotypical people can be fostered. This process leads to a co-design environment where diverse perspectives are acknowledged and considered essential to innovation. It encourages designers and researchers to consider how different users might experience the same technology and to anticipate the need for flexibility and adaptability in design solutions.

In this light, the friction encountered in technology use by those with ADHD becomes a powerful lens through which we can examine and dismantle neuronormative assumptions about technology use and design. It allows us to ask critical questions about who is centred in the design process and whose needs are being met. By interrogating the moments of friction instead of smoothing them over, it is possible to open up new avenues for creating genuinely inclusive technologies.

Therefore, theme 3 is not just a narrative of struggle but of potentiality and possibility. We must recognise the inherent value of diverse user experiences and use the insights gained from friction points to inform more empathetic and responsive design practices. This approach aligns with the overarching aim of PD: to solve problems and transform the way we think about technology, accessibility, and the diversity of human experience.

Conclusion

The PD approach revealed significant benefits for the development of ADHD-friendly technologies. It enabled the emergence of themes such as “Collaborative Understanding as Design Catalyst” and “Assistive Autonomy”, which highlighted the value of incorporating the lived experiences of individualsout with ADHD into the design process. Such integration fosters functional and empathetic technologies to the nuances of ADHD experiences.

Concurrently, the analysis shed light on the challenges of the PD approach. Themes like “Friction in Technology” surfaced, capturing the tensions between user needs and technology's capabilities. Friction was reconceptualised as a barrier and an alternative way to think about innovation and re-examine technoableist design assumptions. This reconceptualisation aligns with the goal of crip technoscience, which sees value in friction as a means to challenge and expand our understanding of accessibility and user interaction.

The challenges, while present, are not insurmountable. They invite designers and researchers to engage with ADHD experiences critically, not shy away from complexity, and view every obstacle as an opportunity for deeper understanding and innovation. These challenges demand a shift in perspective — one that sees the iterative clashes between user needs and design as fertile ground for growth and learning.

Final Conclusion

In navigating the intricate landscape of PD for neuro-inclusive technologies, this thesis has embarked on a journey across various realms — conceptual, empirical, and practical. Spanning Chapters 1, 2, and 3, the exploration has been both broad in scope and detailed in its focus, converging around the central inquiry: How could a participatory approach to HCI design contribute to neuro-inclusive technologies for people with ADHD?

Chapter 1 laid the theoretical groundwork, introducing key concepts and frameworks that would later underpin the analysis. This chapter explored the complex relationship between neurodiversity and ADHD and highlighted how critical disability studies and the disability rights movement challenge traditional medical perspectives, advocating for a more inclusive understanding that situates disability within social and environmental contexts. The chapter also examined the role of the neurodiversity movement, particularly in the context of autism, in reshaping the discourse around ADHD, proposing a more nuanced view of the medical and social models of disability.

Chapter 2 investigated the interplay between technology design and neurodiversity. Through the lens of STS, it concludes that technology and design are value-laden and can potentially marginalise groups. It critiqued traditional technology design methodologies for marginalising neurodivergent individuals like those with ADHD. By conflating feminist and disability theories with its technoscience proponent, this chapter argued for the adoption of agonistic PD as a more inclusive methodology, aligning with the principles of crip technoscience to develop technological artefacts that cater to the diverse needs and experiences of neurodivergent individuals.

Chapter 3, the empirical heart of this work, brought to life the voices and experiences of ADHD individuals engaged in PD. A thematic analysis uncovered the complex interplay of benefits and challenges. Benefits such as deeper collaboration, enhanced autonomy, and technology that truly resonates with the end-user were juxtaposed with challenges like friction in technology and the balance between simplification and customisation.

Synthesising insights from all three chapters, the final conclusion is that a PD approach for neuro-inclusive technologies is not merely a methodological choice but a transformative process that redefines the relationship between user and technology. The PD goes beyond creating tools; it fosters an empowering environment where ADHD individuals are active co-creators, not passive recipients.

This thesis has also revealed that challenges inherent in agonistic PD are integral to its success. Each difficulty encountered represents an opportunity to deepen empathy, refine functionality, and push the boundaries of what is possible. PD catalyses innovative and inclusive technology by embracing the full spectrum of user experiences.

The overarching narrative of this thesis posits that PD is an essential paradigm in creating technology that supports and understands individuals with ADHD. The research underscores the immense value of participatory practices, suggesting they should not be peripheral but central to the design process. It invites future researchers and practitioners to continue this exploration, to build upon these foundations, and to always design with, not for, the community in mind.

In essence, the work presented in this thesis is a testament to the power of inclusion, the richness of collaboration, and the potential of agonistic PD to create technology that serves and celebrates the diverse spectrum of human experiences.

Limitations and Future Research

The PD workshop presents several areas for expansion in future research. First, the involvement of a broader array of stakeholders is crucial. To date, the workshop has predominantly included individuals with ADHD. Engaging a wider circle of stakeholders is essential to avoid the potential for echo chambers and ensure the resulting technologies are viable across multiple contexts. This should include organizations that represent the neurodiverse community, companies invested in accessible technology, and educational institutions that could provide diverse perspectives and resources. These additional voices can enrich the design process, ensuring the developed technologies are robust, versatile, and more widely applicable.

Furthermore, future research should aim to encompass a complete PD workflow. This means extending beyond the ideation phase to prototyping, testing, and, ultimately, implementing a functioning technology. Such a comprehensive approach would validate the initial design concepts and reveal practical challenges and opportunities for refinement that only emerge during real-world application.

Cross-demographic work is another crucial area for expansion. ADHD manifests uniquely across different ages, genders, ethnicities, and socioeconomic backgrounds. Future research should, therefore, aim to include a more diverse participant base to ensure that the developed technologies are universally accessible and effective.

Moreover, an interdisciplinary approach combining neuroscience, psychology, and design insights could offer a more nuanced understanding of ADHD and its interactions with technology. This could lead to innovations that are deeply informed by a scientific understanding of neurodiversity, as well as by the practical realities of living with ADHD.

Lastly, exploring neurodiversity in the workplace is vital for future research. With increasing recognition of the value of neurodiverse talents (Austin & Pisano, 2017; Doyle & McDowall, 2021), understanding how to support neurodiverse employees with technology best can improve individual work experiences and benefit organizational efficiency and innovation. Research in this area could lead to developing workplace-specific technologies that assist neurodiverse individuals in harnessing their unique strengths and thriving in their professional roles.

The findings of this thesis underscore the need for ongoing research and application of inclusive design methodologies in technology development. It calls for broader adoption of PD principles in HCI, particularly in creating technologies that truly accommodate neurodiversity. This approach not only addresses the immediate needs of individuals with ADHD but also contributes to a larger discourse on inclusivity and diversity in technology design, advocating for a digital world that respects and embraces neurodivergent experiences.

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