

Deaf futurity: designing and innovating hearing aids

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Received 1 July 2024 Accepted 26 November 2024

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To cite: Virdi J. Med Humanit 2024:50:678-684.



ABSTRACT

One of the tenets of a posthuman vision is the eradication of disability through technology. Within this site of 'no future', as Alison Kafer describes, the disabled body is merged with artificial intelligence technology or transformed into a prosthetic superhuman. These imaginative possibilities are materialised in a future-oriented mindset in contemporary technological innovation, including hearing aids and other devicessuch as vibrating vests to 'feel sounds' or sign language gloves, what design critic Liz Jackson defines as 'disability dongles'—designed to bypass deafness that simultaneously provide a 'cure' and create a 'post-deaf reality'. Bringing together material culture with crip futurity, history of science, medicine and technology (HSTM), this paper investigates how hearing devices for deaf people have embodied futurity through design and technological features. While mid-20th century analogue hearing aids incorporated fashion through colour and style, 21st century digital hearing aids favour a sleek, industrial aesthetic borrowed from modern architecture, iewellerv and automotive design. Yet discretion remains a persistent and common design feature, meant to diminish obvious symptoms of deafness. Applying what I refer to as the 'disabled gaze'-an autonomous claiming of identity that draws attention to, rather than camouflages, disability-this paper attempts to understand how expanding the breadth of hearing aid design beyond discretion will open possibilities for imagining deaf futurity to radically disintegrate ableist stereotypes and transform how disabled people are represented in society.

In 2014, conceptual artist Elana Langer created hearing aids encrusted with Swarovski crystals for her project, Tools of Life, in collaboration with photographer Hannah Agar (figure 1). Inspired by Langer's grandmother, who felt embarrassed going out with her walker, the project addresses the 'stigma and social discomfort of disability'-as well as geriatrics-to 'open the conversation around assistive devices as a necessity and as a fashion statement' (Agar website). After struggling to convince the grandmother to join the family out on a walk to a restaurant, Langer suggested bedazzling the walker, much to her grandmother's disdain. As Langer recalls saying to her: 'I am trying to make this situation more fun. What's the big deal with a walker? And think of how many other people are like you. We could make a whole business.

This would make it something to be proud of like jewelry'. The grandmother did not find the 'condition of necessity as something to be played with', and though Langer never created the bedazzled walker for her, she 'never stopped thinking it was a good idea' (Langer quoted in Agar 2014).

Liz Jackson and I have written about this inclination of abled people striving to 'save' disabled ones as a problem for how design narratives emerge (Jackson and Virdi 2021). In this example with Langer, adorning and enhancing necessity tools such as walkers present opportunities for having 'fun with these places that cause social discomfort'. The discomfort requires dismissing the grandmother's perception of disability to propose a design solution that would have broader applications as a concept, even if it was created to challenge the 'force of ... vanity' that she experienced. The origin story for Tools of Life thus emerges from two concepts: first, on the trope of disabled people as 'inspiration' for the creation of new technological solutions; and second, as an example of what Ashley Shew calls 'technoableism', that is, the belief that technology positioned as empowerment is a classic form of bias against disabled people (Shew 2023). At both junctures the grandmother's autonomy is minimised for a 'good idea'.

This is not to say that fashion has no place in disability history. Katherine Ott argues that disabled people's use of artefacts tends to be relational-to people, places and power—and actively shapes and defines their identities as well-lived experiences of disability (Ott 2014, 119). This includes assertions of bold design, adding unconventional features to assistive technologies or otherwise proclaiming, rather than diminishing, outward signs of disability. In the industrialised world, access to fashionable clothing and devices could distort class distinctions and enable social mobility (Sweet 2022). Taking a longue durée approach to disability and the body, Kate Annett-Hitchcock outlines how the 'act of being fashionable...has actively contributed to the act of being disabled', such as with corsets and other posture-correction devices for straight-ening the 'unsightly' body while also deforming the gendered dress to meet fashionable trends (Annett-Hitchcock 2023). Similarly, Natalie Wright positions fashion through adaptive clothing to argue how design 'helped to shape public discourse and rhetoric about disability' that had implications on what bodies were considered acceptable to participate in the postwar American project of independence and 'normalcy' as guided by eugenic ideals of citizenship (Wright 2022).

Indeed, themes of normalcy are embedded through Agar's photos for Tools of Life. In one photo, Langer models in black lingerie, wearing

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^{&#}x27;We are pointing out that a modern hearing aid almost defies detection, and that it can easily become a private source of alertness, charm and peace of mind.'-L A Watson, President of Maico, 1955



Figure 1 Bedazzled 'Earring Aid' designed by Elana Langer (2014), with Swarovski crystals, adhered with e6000 glue on a hearing aid. Gift of Elana Langer, Cooper Hewitt Object ID 1158794993. Permission was sought for the image.

her conceptual bedazzled hearing aid alongside opulent chandelier earrings dripping from her ears, leaning against a bedazzled walker in a dressing room. The glamorous backdrop and fashion editorial style of the shoot aimed to transform the experience of deafness into one of beauty, perfectly fitting for the aesthetics that Langer envisioned for her concept. This is evident in her choice of Swarovski crystals, considered to be a timeless luxury in jewellery due to their brilliance and partnerships with haute couture. The shape of the hearing aid itself has not changed, and there is no indication about how the crystals affect the functionality of the device, including whether they interfere with the microphone, toggle switches or complicate wearability due to extra weight. Moreover, while Langer intended for the message to be about promoting a positive sense of sexuality and beauty for disabled people, her decision to model in the shoot—herself being able-bodied—was criticised as disability cosplay (Ellington and Lim 2017, 172).

It is worth noting that Langer's creation is meant to be a conceptual design. She is an artist, after all. Yet conceptual models act as markers for showing what is possible, what the future could be, without taking us any further. The media fervour around the creation is an indication of that; one article asserts that the 'bedazzled hearing aids might change the way you see and hear the world' (Probus 2014). Given that stock images of hearing aid wearers predominately feature joyful elderly people donning bulky beige hearing aids, it is no wonder these bedazzled hearing aids have received attention. Even as a conceptual design, they have dismantled the medicalised cloak around how hearing aids are perceived in Western societies (GN Hearing 2024). Yet, along with numerous other deaf objects in personal or museum collections, Langer's design is material evidence of how deaf futures have been imagined and preserved.

The spectrum of medical care versus social experiences does not always capture the nuances of hearing aids, but design can be considered a catalyst for opposing medicalisation (Anderberg 2005). Katie Brown argues that there are two prominent narratives about hearing aid design: 'skin-colored features for concealment or metallic 'robotic' designs borrowed from consumer electronics (Brown 2019). The former is a feature of the long history of electronic miniaturisation and its parallel development to the medicalisation of hearing aids in response to comforting American ideals of self-cultivation and citizenship. For deaf people, wearing and concealing a hearing aid demonstrates a commitment to 'normalcy', even if it is merely a performance to

Original research

'pass' as hearing (Virdi 2020). The latter, however, hints towards a bionic future, in which 'design can open up dialogue', as Brown asserts; this approach becomes another way of making deafness invisible and further propagating stigma and ableism against deaf people (Brown 2019). As a hyperfocus on invisibility prompts hearing aid wearers to pass, conceal or minimise their disability, it becomes challenging for identity construction, particularly if wearers have to navigate between the two communication worlds of d/Deaf and Hearing (Beckner and Helme 2018; Harmon 2013). It also means the focus on invisibility continues to perpetuate perspectives that deafness is shameful or needs to be hidden, thereby contributing to feelings of self-consciousness and inadequacy in deaf people, especially those with age-related hearing loss who are reluctant to obtain proper aural care.

'Every new technology', George Estreich writes, 'is accompaby copyright nied by a persuasive story, one that minimizes downsizes and promises enormous benefits...Too often that narrative frames disability as a cost' (2019, xiv). Though analogue hearing aids of the 20th-century incorporated fashion through colour and style, 21st century digital hearing aids favour a sleek, industrial aesthetic that aims to bypass deafness to simultaneously provide a 'cure' and create a 'post-deaf' reality—even though the overall Bui design of hearing aids have scarcely changed. This paper examines the history of hearing aid design to understand how design features of discretion and futurity are problematic and convey negative associations of deafness. Tracing the persistent feature of discretion, this paper positions the concept of the 'disabled gaze'-which draws attention to, rather than camouflage, disability-to explore how the breadth of hearing aid design beyond discretion will open possibilities for imagining deaf futurity and radically disintegrate ableist stereotypes.

THE OLD IS MADE NEW AGAIN

Before there was Langer's conceptual design, there was Soundfinder's 'Earing for Hearing'. Brushed bronze with a metal filigree cast over plastic, these transistor hearing aids resembled vintage half-bead earrings that one can find in antique stores, save for the curved tube extending from the flat back, a raised component door for a size 13 button battery and a geared volume switch (Advertisement 1968). Created by Sound Ear, of Mount Kisco, New York, in the mid-1960s, the device appears to be an astonishing innovation, perhaps even ahead of its time. Technological miniaturisation, as Mara Mills argues, is typical of hearing aid design, and Soundfinder's creation was no exception (Mills 2011). With the flexible printed circuit board consisting of the transistors and integrated circuits encased in a space no larger than 2.7 inches in diameter, these were small hearing aids, comparable to eyeglasses hearing aids with technical components built into the frames. They were attractive options for deaf users (especially women) who wanted discreet instruments that could blend in with their personal style. To wear the device, a user would connect the tone hook (the curved tube) to their earmould inserted into the ear; the 'earring' part would freely hang downwards or be attached with a clip to secure it to the earlobe.

Marketed as the 'Hearing Jewel', the instrument was promoted as 'the world's smallest hearing device', developed for those 'who hear but don't understand, if words run together' (figure 2). Sound Ear's president, Thomas G Broderick, had previously worked for Tonemaster and Otarion, two prominent industry firms, and certainly possessed the engineering and marketing experience to launch new hearing aid models. Despite claims the Hearing Jewel was designed for a narrowly defined group of

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Figure 2 Advertisement, The Panama City Herald (8 January 1972, 6).

people with 'nerve deafness', that is, for 'those people who need that extra clarity in conversation, while watching television, at a concert, in the theatre or church', the device failed to meet basic standards for hearing aid performance (Star Gazette Advertisement 1971). Quite possibly, the Hearing Jewel never moved beyond the prototype stage. Broderick's company appeared as a startup compared with the giants of the industry and given that the Soundfinder trademark was not renewed by 1975, it is probable that the product could not compete with other hearing aids on the market.

Deaf consumers nevertheless had a multitude of options for 'hearing jewels' from other hearing aid manufacturers, though these were predominately accessory attachments, rather than stand-alone instruments. Two decades prior, for instance, Maico created the 'Hear-Ring' which permitted women to conceal their receiver under a pair of matched earrings secured by a plastic holder. The receiver is connected to a wire to their hearing aid, and depending on preference, could either be worn underneath their hair or at the top of a bra strap. Designed by Fresen of California for Maico, the 'earrings' could be fitted for any hearing aid model and specially ordered earmolds. They were immensely popular, especially after Maico placed fullpage advertisements in Vogue's September 1955 issue to frame their products as fashionable luxury goods (The Hearing Dealer 1955). Other firms followed suit in the 1950s and 1960s to incorporate the cosmetic effects of hearing aids with fashion. Ardente of London in 1951 created a hat for women that included concealed pockets for the hearing aid and external battery. Versions of hearing aids to be worn on the wrist, in the hair or even special wigs-including one created by celebrity makeup stylist Max Factor—were available for deaf people. Industry giants Sonotone introduced the 'Sono-Charm' jewelled pins and 'Sono-Comb' hidden microphones; Tonemaster created their 'Cordless Barrette'; Beltone created decorative microphone covers for their 'Opretta' hearing aids and also disguised their 'Triumph 5 Super' 6-transistor hearing aid as a stainless-steel tie clip. As advantageous as these accessories were

for disguising the devices, they were not ideal for security, for the anchorage to the body was weaker, thus could accidentally fall and damage the transducers (Berger 1974, 117).

The advent of the transistor and the integrated circuit made it possible to combine the microphone, amplifier and receiver in a single unit with further miniaturisation as the decades passed. Behind-the-ear and in-ear models increasingly replaced bodyworn units capable of binaural fitting, and, as the size reduction of components continued into the 1990s, so too did the variability of five or six companies—essentially standardised aesthetics, with most device models offered in a range of colours to blend **g** in with skin or hair, rather than to appeal to fashion or stylistic preference. Technical innovation continued, with the emergence of digital hearing aids in the late 1980s, and further experiments in improving power supply, acoustic gain or minimising the microphone feedback and harmonic distortion of analogue hearing aids. Essentially, with the 'modern' hearing aid, the design gave way to medicalisation (Pollack 1975).

The notion that deaf people should feel compelled to use concealable hearing aids reflects societal stigma as encapsulated through design. Scholars have demonstrated how the concept of a prosthetic 'good fit' for a technology to be effective and comfortable requires integration with the body to the extent that either a user forgets they are wearing or using technology, **og** or the machine merges with flesh (Almond-Brown 2023; Porter, Walter, and Healey 2018; Virdi 2017). For some users, this might become another strategy for passing, that is, to conceal visible markers of disability to suppress their conceive 'otherness', avoid stigma and appear 'normal'. Yet passing itself is a personal act, one dependent on life circumstances and environment more so than disability politics or ableist assumptions, an act that, as Jeffrey Brune and Daniel Wilson (2013, 2) explain, 'blurs the line between disability and normativity'. Rejecting this binary requires a shift in perspective. In the case of hearing aids, rather than balancing choices between aesthetics and functionality for purposes of passing or 'un/covering', deaf users' incorporation

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of fashion and style offers fundamental new insights for product design (Evans 2017).

RECONSIDERING DESIGN-AS-DISCRETION

The manifesto of crip technoscience as devised by Hamraie and Fritsch (2019) 'calls attention to the powerful, messy, noninnocent, contradictory...practices of critique, alteration, and reinvention of our material-discursive world'. By addressing dimensions of lived experiences of disability and technological design beyond functionality or aesthetic, crip technoscience presents approaches for analysing practices of what Hartblay (2020) terms as 'disability expertise' for situating disabled people as theory and design producers. Disabled people are positioned as experts and designers, but more crucially, their perspectives on design for their everyday technologies-like hearing aidsare embedded with political meanings, including normalisation through assimilation, or resistance and protest. As Aimi Hamraie emphasises, the 'politics of disability technology raise important theoretical and empirical questions about epistemologies, methodologies and social implications of design by, rather than for, disabled people' (2023, 304). This includes notions of futurity, but it does not imply all deaf users of hearing aids are preoccupied with design or the vanity of passing, a point expressed by Kimberly Fields (2006): 'vanity doesn't get to be a factor in the decision [of wearing hearing aids]. Less than 10 decibels away from the category of deafness, my unaided hearing loss would keep me out of mainstream society'.

One method of incorporating crip technoscience and disability expertise for reconsidering hearing aid design is with the concept of 'Supernormal' introduced by Graham Pullin as borrowed from Japanese industrial designer Naoto Fukasawa and British product designer Jasper Morrison. A 'new approach to disability-related design, at once radical and unremarkable', the Supernormal rejects the binary of drawing attention to or from disability, and instead proposes thinking about design as how objects are used in everyday contexts-that is, objects we tend not to think about because they are not disruptive to our environment (Pullin 2018). Pullin elaborates: 'We imagine a super normal hearing aid that is beautifully resolved in form, materials and details-to the degree that evewear is-yet unmistakably, unashamedly and unremarkably a hearing aid. Not as an ironic statement in anti-design but as an object with positive connotations'. This includes rethinking the material of hearing aids. By incorporating Supernormal materials (cellulose, leather, wood), the design draws us to natural elements that embody familiar environments. Product design thus becomes about easing into the body of nature, as opposed to adding cold, hard elements such as titanium that disrupt the organic flow of the body. Arguably, the Supernormal becomes another way of thinking about good fit and discretion, but Pullin insists that the Supernormal is divorced from any political meaning of assimilation. It does not stand apart nor disappear but is just there such that we become accustomed to its presence without the need to engage with its existence. Within this framework, hearing aids designed as super-bionic futuristic devices become an aberration in our environment, an unintuitive feature far removed from present reality.

The futuristic approach can appeal to deaf people who think of themselves as disabled or as a linguistic minority, but it disturbs the phenomenon of individual practice and collective engagement typical of disability culture (Hamraie 2023, 305). Deaf and disabled people learn strategies of adaptation, accommodation, assimilation and anti-assimilation from their communities, but

at the same time, vanity can direct their individual choice for discretion-an understanding long exploited by hearing aid firms in advertisements. Though 'fashion can be understated, and discretion does not require invisibility', as Pullin emphasises, the tension between the two in design communities means that one quality must be categorised as a priority (Pullin 2009, 15). This is exemplified in the evolution of spectacles from medical aids to fashion accessories such as evewear. The design of evewear takes into consideration the entirety of the face: how it sits on the bridge of the nose, balances the eyes and eyebrows, accentuates the cheekbones, frames against the hair and sits comfortably on the ear. There are colours and shapes, sizes and depth of lenses, nearly an infinite possible combination to appeal to a person's face, style, cost and preference.

Why not the same for hearing aids? Why do discretion and 2 miniaturisation remain the primary design criteria? As Pullin copyright points out, 'If anything, you might expect hearing aids to be less challenging than glasses: they don't obscure the face; they are strong traditions of ear adornment and jewelry in most cultures; and we all reach for earphones and headphones from cultures; and we all reach for earphones and headphones from time to time' (Pullin 2009, 25). Though the hearing aid industry has remained conservative and preoccupied with technological development, especially in the American context, the design paradigm is complicated by the fact hearing aids are not covered ð by insurance and the industry remains a monopoly with exorbitant prices. The visually stunning HearWear objects designed by Ross Lovegrove for the Royal National Institute for the Deaf, for example, offer a fresh perspective for merging organic forms with style, but even if they are 'the antithesis of current hearing aids', can they be functional across the auditory spectrum? (Pullin 2009, 28). text

HearWear is resemblant of mid-century body-worn hearing aids that rejected discretion as a primary design feature, and instead emphasised colours, styles and decoration as marketable elements. Zenith's 'Royal' line was produced with a brilliant gold-coloured plastic chassis with a black circular grate for the microphone adorned with the company crest, surrounded by steel gold-coloured clips (for securing in a pocket), and a braided wire emanating from the top connected to the earpiece (figure 3). Dahlberg's 'Special' transistor hearing aid, with its brilliant blue and retrofuturism hints toward an atomic age, while Maico's "Universal' models in two shades of blue (AX in turquoise and BX in navy) are more subdued and serious, echoing perhaps, its traditional approach as one of the earliest hearing aid companies (Bauman, Maico Model AX, Maico Model BX). Paravox's hammered chassis with a floral microphone grill leans towards the sophistication of Art Deco, as does Zenith's rose gold Regent model (Bauman, Zenith Regent, Paravox Model). Acousticon's transistorised hybrid model A-300 is an experiment in materials (Bauman, Acousticon A-300). All these models feature aspects of that go beyond functionality to appeal to a customer's personal preferences—their style fashion and the fashio outline counternarratives to discretion by drawing attention to the device and bypassing the masquerading of disability to claim the disabled gaze and reject typical representations of deaf users. Through the disabled gaze, deaf users of these bold instruments prefer to visually signal their disability, including as a coping mechanism for everyday interactions or communication struggles. As Zdrodowska (2021) elaborates:

If someone does not realise that they are speaking to a deaf person because that person does not use hearing aids or because the hearing aids they use are not visible (which was and remains the ideal and the

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Figure 3 Zenith Royal Hearing Aid, c.1950s. Aluminium, metal, plastic, steel, 2.125 × 2.25 × 0.75. CC Attribution 4.0 International, courtesy of Science History Institute.

goal in the development of hearing prostheses), they may perceive the deaf person as strange, rude or intellectually disabled. The deaf and hard of hearing cannot answer questions they do not hear (Zdrodowska 2021, 137).

While this is a crucial argument that is also shown across other prostheses and assistive devices-stickers on wheelchairs, coloured canes, painted limbs-it does not translate well to midcentury hearing aids that were meant to be worn on the body (Ott 2002, 3). For one thing, no matter how intricate the design or how beautiful its features are, hearing aids were still meant to be pocket devices. Nevertheless, even if deaf people were instructed to keep their hearing aids in pockets or carriers, it does not necessarily mean they did so as a way to camouflage the instruments. As Hamraie argues, crip-making 'relies on and produces form of knowledge and expertise that draws boundaries between assimilation and antiassimilation, able-bodied norms and disability culture' (2023, 304). Deaf painter Dorothy Brett (1883–1977), for instance, crafted a leather case bartered leather, adorned with silver and turquoise pieces sourced from the Pueblo market to demand attention to her deafness (Virdi 2023). The disruptive box that housed her hearing aids, its use uncertain at first glance except for the sole wire emanating from an opening at the top, encroaches on polite conversations, more so when Brett positioned it in front of her body, insisting speakers to acknowledge its presence. Certainly, this could be merely artistic eccentricity, but the care that went into the case serves as a protective barrier: for the hearing aid itself, and for Brett's need to self-manage ableist perceptions of her deafness within her hearing environments.

The history of the mid-century design of hearing aids further demonstrates how bold design-forward approaches can be a confidence boost for users. Contemporary design presents ways for merging one's identity and fashion as a new generation of HearWear, a trend already noticed in the tech industry where research indicates there is a rise of hearing aid wearers in their

30s and 40s who are appealed by the design of smart hearing aids featured with associated applications for autonomous adjustment. Children are also encouraged by colours, patterns, Disney/ Marvel characters or futuristic options that add excitement to their devices. The old 'Big and Beige' prominence of hearing aid design emphasising camouflage seems to be disappearing (Cadwell 2023). This shift, however, presents another problem. As wearable health-tech companies take over hearing aid design to bring design innovations to a broader market, they tend to replicate the invisibility trope. Nearly every year Soundly (a tech site that reviews sound technologies) lists the latest 'smallest and Protected smartest' invisible hearing aids entering the market or introduced as prototype. The Aura Ring, for instance, is another version of the Eargo, a rechargeable, 'virtually invisible' device that extends design to the product packaging (Cadwell 2023). ŝ The chromed metal, high-gloss Zon Hearing Aid, designed by copyright Stuart Karten Design in 2008 for Starkey, received the Cooper Hewitt, Smithsonian Design Museum's People Design Award for its visual appeal. Yet the product description highlights the palette of six colours that are meant to be 'virtually invisible , including when worn'. Phonax's 'Paradise' also offers housing colours in seven options to match hair and skin; though, to their credit they do provide at least 28 colours for earmolds to personalise the device.

If culture influences technological design, what if we change our expectations about deafness and hearing aids, to centre deaf perspectives rather than industrial and product design?

DEAF-LED DESIGN?

ð One of the tenets of a posthuman vision is the eradication of disability through technology, a process governed by eugenic impulses towards human perfection. Within this site of 'no future', as Kafer (2013) describes, the disabled body is merged with artificial intelligence technology or transformed into a prosthetic superhuman. These imaginative possibilities materialise in a future-oriented mindset through technological innova-tion that leaves no space for disability. As Murray (2020) asserts, 'Disability *futures* are almost never thought to be desirable and appear rather as fraught spaces of struggle' (original emphasis). Hearing aids, for instance, are elevated beyond their auditory benefits, to futuristic creations such as vibrating vests to 'feel sounds' or sign language gloves-innovations that design critic Liz Jackson defines as 'disability dongles' (Jackson, Haagaard, and Rua 2022). These are objects that are designed to bypass deafness to simultaneously provide a 'cure' and create a 'postdeaf reality' while simultaneously adhering to an overtly utopian discourse of world transformation that enacts proselytising impulses, as Jonathan Hsy cautions (Godden and Hsy 2018, 101).

Objects inform the concept of disabled selfhood and expectations of what Kafer describes as 'crip futurity', a world in which disabled perspectives and expertise are essential for technological design and community building (Kafer 2013, 3). Crip futurity is a longing for a future world-making where disability is welcome-not eradicated-and the knowledge of disabled ancestors is central for incorporating collective expertise and practices of everyday lived experiences of disability. Disabled people have long been the 'original lifehackers', to borrow Jackson's term, adapting to barriers and adding their unique insights to elegantly make their world more accessible (Jackson 2018). Applying their disabled expertise, through the disabled gaze, disabled creators aim to transform the freakery and spectacle of their bodyminds to favour a more inclusive and progressive

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rhetoric of disability (Garland-Thomson 1997). This is apparent in the tension between aesthetics and futurity embedded in the history of hearing aid design, where deaf wearers favoured models that appealed to their own preferences, without necessarily thinking of futuristic aspects of disabled living or always adhering to expectations of normalcy.

Design and disability appear to be contingent and historical. Indeed, Bess Williamson and Elizabeth Guffey (2020) presented the 'Design Model of Disability' as a concept for examining how design and knowledge-making processes are entrenched in disability experiences, particularly through digital or material things. Instead of centring historical narratives of analytical perspectives of disability things through their connection to bodily cure, accommodation or rehabilitation, Williamson and Guffey argue that design provides useful, nuanced contexts for examining the relationship between disabled users and their objects. Emphasising design enables us to shift from discretion to assertion, and in so doing, design becomes about reclaiming and fostering identity. Disabled people are designers. Objects are designed for disability, rather than to suppress disability. And design is presented as a range of approaches for interacting with the built environment, though it also can create barriers as much as it can provide solutions. Focusing predominately on technology and innovation can, for instance, diminish the contextual histories of user tinkering and adaption that underscores much of the lived experiences of disability, as Laura Mauldin's Disability at Home project shows (Mauldin 2022). Moreover, though disabled people may not always act as designers, their low-tech hacks, modifications and preference for design is not always acknowledged or translated to improved product development.

This appears most assuredly in the legacy of fashion and style in hearing aid design-though it is important to note that some users do prefer concealable aids, which is absolutely fine as there is no one way of being deaf. Custom-made options for coloured chassis or ear moulds, skin covers, charms and stickers for tube have been available as accessories through manufacturers to personalise their hearing aids or cochlear implants. Transforming hearing aids into fashion statements is part of the trend of the 'personal appearance market', one in which unique accessories offer users to beautify or personalise their devices to better reflect their personalities. There are numerous sites online with instructions for creating do-it-yourself (DIY) 'hearrings', or available to buy on Etsy. Designs feature a range of colours, pearl-clasped moulds, crystal or silver charms and chains and even diamond-encrusted attachments hanging from the tubing of the hearing aid. Wanting her daughter to accept the hearing aids, Suzannah Parker created a company selling hearing aid charms to act as 'a doorway to the conversation about hearing aids and what they are' (McGorry 2024). Jenni Ahtiainen, the designer and founder of Finnish-based DEAFMETAL, created the range of adaptive jewellery after struggling to accept her own hearing aids: 'My hearing aids became part of me when I transformed them' (Ahtiainen 2024). These fashion-forward designs are not new, of course. Deaf designers have been creating their own attachments and circulating instructions through deaf newsletters and community ephemera for decades.

Collectively, these DIY adaptations demonstrate the scope of personal aesthetics and design for assistive technologies, but more importantly, they showcase the creative possibilities that arise when pushed back against the medical gaze of disability—and the potential for inclusiveness when we incorporate the disabled gaze, much like how Sophie de Oliveria Barata used the medium of prosthesis to create highly wearable art pieces with her Alternative Limb Project. Could there be bolder approaches that completely redesign the shape of hearing aids? College students offer instructables for reshaping hearing aids into conspicuous animals—hummingbird, whale, bat, giraffe and elephant—creating concept prototypes for bringing 'more self-esteem to hearing-impaired group [sic] because their animals remind them of their capabilities and worthiness' (Hearing Aid Formation). Patronising statement aside, the design concept is interesting, but likely only appealing to children or individuals who want bold, unique creations; still, there is no indication as to whether this design hampers the functionality of the hearing aid. Even Alice Turner's Amplify, a 'socially inclusive design' that received rave reviews, is reliant on bone conduction technology and not suitable for all deaf people.

Designer Lauren Regolini collaborated with jewellery designers to create hearing aid attachments for a charity event 2 for Telethon Speech & Hearing featuring deaf models wearing gorgeous pieces that were an indication of a futuristic conception of hearing aids reconceptualised as everyday accessories Regolini's design, however, was not meant to expand to a market. Deaf transgender artist Chella Man, on the other hand, created a similar concept to accentuate the hearing aid or cochlear implant as an art form, partnering with Private Policy, a genderless Asian-led fashion brand (Allaire 2021). The handmade, flexible gold-plated designs launched in 2021 with sculped ear cuffs to be attached to hearing aids, priced between US\$330 and US\$620, with 50% of sales going to the Deaf Queer Resource Center. As expensive as these were, again, they were a limited edition. Recently, French deaf designer Kate Fichard, owner of PAIRED, used three-dimensional printing to apply strong design to hearing aids beyond technology and performance. Winner of the Grand Prix du Jury Swarovski in fashion accessories in 2018, PAIRED designs aim to 'bring the world of jewelry to audio devices' through the line of EarWear. Of all the products available, the 'shell' for hearing devices is sold out (and have been for a while, because I was even willing to spend the \notin 350 on them!).

Does this mean deaf futures are limited? Or is beauty merely fleeting? Whether it is EarWear or HearWear, these designs prompt us to view deafness technologies as objects on the same scale as how spectacles were rebranded as 'eye wear'. Above all, they ask us to shift our ableist conceptions of deaf people as always wanting invisible devices. That deaf people should feel compelled to disguise their impairment with an invisible technology says a lot about how deafness is stigmatised. Jewelled hearing aids are not new creations, nor is the use of fashion and style to draw attention to disabled bodyminds. To consider these designs for deaf future, however, means we need to reconsider how hearing aids are perceived to claim, and own, deaf pride.

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Contributors JV has done 100% of the work for this paper and is the guarantor.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. All data relevant to the study are included in the article.

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BIBLIOGRAPHY

- Advertisement. 1968. "'Soundfinder Micro Device Developed for Nerve Deafened.'" In The Sentinel
- Advertisement. 1971. "New Help for the Hard of Hearing". In Star Gazette
- Agar, H. 2014. "Tools of Life". flickr. Available from: https://www.flickr.com/photos/ hannaagar/14584271170
- Agar, H. n.d. "Tools of Life". Available from: https://hannaagar.com/tools-of-life
- Ahtiainen, J. 2024. "I Looked Like Me". In Hearing Health Foundation. https://hearinghealt hfoundation.org/blogs.
- Allaire, C. 2021. "A New Jewelry Collaboration Celebrates the Deaf and Hard of Hearing Communities". Vogue. Available from: https://www.vogue.com/article/private-policychella-man-jewelry-collab-deaf-community
- Almond-Brown, G. 2023. Spectacles and the Victorians: Measuring, Defining and Shaping Visual Capacity. Manchester University Press.
- Anderberg, P. 2005. "Making Both Ends Meet". Disability Studies Quarterly 25 (3).
- Annett-Hitchcock, K. 2023. The Intersection of Fashion and Disability: A Historical Analysis. Bloomsbury
- Bauman, N. n.d. "Maico Model AX 'Universal' Transistor (Body) Hearing Aid". The Hearing Aid Museum. Available from: https://hearingaidmuseum.com/gallery/Transistor%20(Body)/Maico/info/maicoax.htm
- Bauman, N. n.d. "Zenith 'Regent' [Mod II] Transistor (Body) Hearing Aid". The Hearing Aid Museum. Available from: https://hearingaidmuseum.com/gallery/Transistor%20(Body)/ Zenith/info/zenithregentii.htm
- Bauman, N. n.d. "Paravox Model K Transistor Body Hearing Aid". The Hearing Aid Museum. Available from: https://hearingaidmuseum.com/gallery/Transistor%20(Body)/ Paravox/info/paravoxk.htm
- Bauman, N. n.d. "Acousticon Model A-300 Hybrid Hearing Aid". The Hearing Aid Museum. Available from: https://hearingaidmuseum.com/gallery/Transistor%20(Body)/Paravox/ info/paravoxk.htm
- Bauman, N., n.d. "Macio Model BX 'Universal II' Transistor (Body) Hearing Aid". The Hearing Aid Museum. Available from: https://hearingaidmuseum.com/gallery/ Transistor%20(Body)/Maico/info/maicobx.htm
- Beckner, B. N., and D. W. Helme. 2018. "Deaf or Hearing: A Hard of Hearing Individual's Navigation Between Two Worlds". American Annals of the Deaf 163 (3): 394-412.
- Berger, K. 1974. The Hearing Aid: Its Operation and Development. National Hearing Aid Society
- Brown, K. 2019. "Redesigning Hearing Aids". Antenna, 20November. YouTube, 10min., 18 sec. Available from: https://www.youtube.com/watch?v=p2GHGm22I1M
- Brune, J. A., and D. J. Wilson, eds. 2013. Disability and Passing: Blurring the Lines of Identity. Temple University Press.
- Cadwell, B. 2023. "Hearing Aid Design Is Shaking off 'Big and Beige' Roots". Soundly. https://www.soundly.com/blog/hearing-aid-design-evolution DEAFMETAL: https:// www.deafmetal.store/.
- Ellington, T. N., and S. R. Lim. 2017. "Rendered Powerless: Disability versus Westernized Beauty Standards". QED 4 (3): 170-76.
- Estreich, G. 2019. Fables and Futures: Biotechnology, Disability, and the Stories We Tell Ourselves. The MIT Press.
- Evans, H. D. 2017. "Un/Covering: Making Disability Identity Legible". Disability Studies Quarterly 37 (1).
- Fields, K. 2006. "Diva in Hiding: Suffering from Hearing Aid Vanity". Disability Studies Quarterly 26 (3).
- Garland-Thomson, R. 1997. Extraordinary Bodies: Figuring Physical Disability in American Culture and Literature. Columbia University Press.
- GN Hearing. 2024. "The New Norm". Available from: https://www.gn.com/the-new-norm

Godden, R. H., and J. Hsv. 2018. "Universal Design and Its Discontents". In In Disrupting the Digital Humanities, edited by Dorothy Kim and Jesse Stommel. Punctum Books

- Hamraie, A. 2023. "Crip Making". In In Crip Authorship: Disability as Method, edited by Mara Mills and Rebecca Sanchez. New York University Press.
- Hamraie, A., and K. Fritsch. 2019. "Crip Technoscience Manifesto". Catalyst 5 (1): 1–33.
- Harmon, K. C. 2013. "Growing Up to Become Hearing: Dreams of Passing in an Oral Deaf Education". In In Disability and Passing: Blurring the Lines of Identity, edited by Jeffrey
- A. Brune and Daniel J. Wilson, Temple University Press. "Hearing Aid Formation". n.d. https://www.instructables.com/Hearing-Aid-Reformation/.
- Hartblay, C. 2020. "Disability Expertise: Claiming Disability Anthropology". Current Anthropology 61 (S21): S26-36.
- Jackson, L. 2018. "We Are the Original Lifehackers." The New York Times.
- Jackson, L., A. Haagaard, and W. Rua. 2022. "'Disability Dongle.' Platypus: The CASTAC Blog)". Available from: https://blog.castac.org/2022/04/disability-dongle

In The Hearing Dealer. 1955. "Maico Ad in Vogue Has Fashion Theme"

Jackson, L., and J. Virdi. 2021. "Beyond Functional: Unraveling the Long Line of Disability Fashion". bitch media. Available from: https://web.archive.org/web/ 20211101204030/www.bitchmedia.org/article/disability-fashion-history-accessissue

Kafer, A. 2013. Feminist, Queer, Crip. Indiana University Press.

- Mauldin, L. 2022. Disability at Home. https://www.disabilityathome.org.
- Cool Accessories". FoxNews Digital. Available from: https://www.foxnews.com/health/ all-ears-sexy-hearing-aids-designers-transform-key-devices-cool-accessories
- Mills, M. 2011. "Hearing Aids and the History of Electronics Miniaturization". IEEE Annals of the History of Computing 33 (2): 24-45.
- Murray, S. 2020. Disability and the Posthuman: Bodies, Technologies, and Cultural Futures. Liverpool University Press.
- Ott, K. 2002. "The Sum of Its Parts: An Introduction to Modern Histories of Prosthetics". In In Artificial Parts, Practical Lives: Modern Histories of Prosthetics, edited by Mihm Stephen. New York University Press/ PAIRED. https://paired-earwear.com/en/pages/ la-marque.
- Ott, K. 2014. "Disability Things: Material Culture and American Disability History, 1700-2010". In In Disability Histories, edited by Susan Burch and Michael Rembis. University of Illinois Press.

Pollack, M. C., ed. 1975. Amplification for the Hearing-Impaired. Grune & Stratton.

- Porter, C., K. Walter, and Margaret. Healey. 2018. Prosthesis in Medieval and Early Modern Culture. Taylor & Francis.
- Probus, J. 2014. "These Bedazzle Hearing Aids Might Change the Way You See and Hear the World". Buzzfeed. Available from: https://www.buzzfeed.com/jessicaprobus/thesebedazzled-hearing-aids-might-change-the-way-you-see-an
- Pullin, G. 2009. Design Meets Disability. The MIT Press. https://www.laurenregolini.com/ designerhearing.
- Pullin, G. 2018 "Super Normal Design for Extraordinary Bodies". In Manifestos for the Future of Critical Disability Studies, edited by Ellis Katie. Routledge.
- Shew, A. 2023. Against Technoableism: Rethinking Who Needs Improvement. W.W. Norton & Company.
- Sweet, R. 2022. "Prosthetic Body Parts in Nineteenth-Century Literature and Culture". Springer. Available from: https://thealternativelimbproject.com/

Virdi, J. 2017. "Between Cure and Prosthetic: 'Good Fit' in Artificial Eardrums". In In Rethinking Modern Prostheses in Anglo-American Commodity Cultures, 1829-1939, edited by L. J. Claire. Manchester University Press.

Virdi, J. 2020. Hearing Happiness: Deafness Cures in History. University of Chicago Press. Virdi, J. 2023. "Dorothy Brett's Leather Case". In In After Universal Design, edited by

- Elizabeth Guffey. Bloomsbury Williamson, B., and E. Guffey, eds. 2020. Making Disability Modern: Design Histories.
- Bloomsbury Wright, N. E. 2022. "'Functional Fashions for the Physically Handicapped': Disability and
- Dress in Postwar America". Dress 48 (2): 143-62.

Zdrodowska, M. 2021. "Prosthetic Performances". Icon 26 (2)

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- McGorry, A. 2024. "All Ears for 'Sexy' Hearing Aids: Designers Transform Key Devices into