THE BODY CAN NOT BE THOUGHT: design practice at the intersection of human-computer integration and critical disability studies to develop new paradigms for health and well-being

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Abstract

This paper explores the intersection of Human-Computer Integration (HInt) and Critical Disability Studies (CDS) to explore how a posthumanistic epistemology in design can produce knowledge and know-how for the application domains of Health and Well-being. To use disability as a catalyst for innovation, a rethinking in the philosophy of sciences is necessary to establish knowledge production that emerges from new fluid politics that operate in 'composition' instead of 'organization'. By placing an emphasis on nomadic practices that move beyond fixed borders, the encounters between Disability Studies or Human-Computer Integration can produce situated, embodied and contingent design knowledge that study deviant and complex embodiment, and the kinds of alterations of human characteristics and abilities through technology. The first section of this paper explores the rethinking in the philosophy of sciences. The second section argues for a posthumanistic epistemology in design, which can be seen as the perfect way to produce situated, embodied and contingent design knowledge on the intersection of HInt and CDS. The final section of this paper highlights the potential for the disciplines of Somatechnics and Soma Design to engage in each other's body of knowledge to produce transformative knowledge through a shared focus on deviant embodiment and disability. The takeaway message of this paper is that the intersection of HInt and CDS potentially leads to new – otherwise overlooked - insights on the human-technology relationship, and therefore can take part in the historical strive for man-machine symbiosis. The posthumanist epistemology allows for alternative ways of thinking that move beyond the current Humanist perspective, and builds on a plural, relational and expansive foundation for the development of design practices that catalyze innovation in the application domains of Health and Well-being.

Author keywords

human-computer integration; critical disability studies, design epistemology, philosophy of science; disabled body, disability, deviant embodiment, complex embodiment; conflict, connectivity, creativity; design practice, nomadic practice.

Introduction

Current developments in the field of Human-Computer Integration (HInt) (Mueller et al, 2020) shift the focus away from the 'stimulus-response' model of HCI towards integral relationships between humans and computers (Danry et al., 2021), that have the potential to fundamentally alter human characteristics and abilities through computing systems (Andres, 2023). The paradigm shift towards HInt can be seen as a continuum from interaction to integration, which extends but does not replace the HCI field (Farooq & Grudin, 2017). HInt operates from a different worldview than the often traditionally narrated stories on the progression of man, which are rooted in ideas on Enlightenment embodiment (Mitchell et al., 2019). This worldview 'proclaims to the Renaissance parameters of Vitruvian symmetry and aesthetic perfection' (Braidotti, 2013). In Human-Computer Integration, which is part of the historical strive for man-machine symbiosis (Licklider, 1960), provides an opportunity to question, collapse, or even eliminate traditional perspectives on what it means to be 'human'. These relationships between humans and computers revolve around symbiotic partnerships between humans and computers (Semertzidis et al., 2022), which means that the relationships exist upon interdependence, focusing on 'complex relations of trust, respect, dependence and communication' (Wolfe, 2010), rather than putting the emphasis on values of agency, ownership, and autonomy. An example of such a scenario is the bodily integration with 'computing systems that can sense, interpret, and automatically act to body-based and contextual signals' (Andres, 2023). Designing for the 'webs of asymmetrical relationships' (Shildrick, 2022) in bodily integrated systems (Mueller et al., 2021) requires a deep understanding of micro-biologies, (bio)assemblages,

or phenomenology of organ and tissue (Shildrick, 2022). Alternative ways of thinking about embodiment are necessary to move beyond the separate disciplinary structures that exist in scientific organization. Critical Disability Studies (CDS) historically has required alternative ways of thinking as it has always been 'about the kind of complex relationship between the body and the machine' (Braidotti, 2006), and 'has always contravened the traditional, classical Humanist conception of what it means to be a human being' (Goodley, 2017). Therefore, Critical Disability Studies can be seen as a well-established body of knowledge, that starts from traditionally narrated divisive and pathologized bodies to uncover alternative materialities to bring bodies and minds into being (Mitchell et al., 2019). In this paper we highlight a posthumanist epistemology for design at the intersection of Human-Computer Integration and Critical Disability Studies, to allow us to move beyond the current Humanist perspective. A posthumanist epistemology builds on the development of design practice through a plural, relational and expansive foundation, aimed at the potential catalyzation of innovation in the application domains of Health and Well-being. The *first* section of the paper starts with a rethinking of the philosophy of science, moving away from rationality-oriented (humanistic) philosophy towards a relationality-oriented (posthumanistic) philosophy. The *second* section explains our ideas on posthumanist design practice further in depth and emphasizes a compatible connection between HInt and CDS. The final section highlights the potential for the disciplines of Somatechnics and Soma Design to produce transformative knowledge for both Critical Disability Studies and Human-Computer Integration through a shared focus on deviant embodiment. We *conclude* with a short reflection on the intersection of HInt and CDS, and how this potentially leads to new – otherwise overlooked - insights on the human-technology relationship.

CONFLICT – Paradigm shift from rationality to relationality

As this emerging paradigm shift in Human-Computer Integration has more to do with 'becoming-in-the-world' (Shildrick, 2022) than with 'being-in-the-world', the contingency of its existential-ontological evaluation (Keane, 2015) requires a rethinking in the philosophy of sciences to establish alternative modes of knowledge production which are able to integrate the disciplines of Critical Disability Studies with Human-Computer Integration.

Philosophy of Science

The ongoing debate regarding the potential meanings of technology in the application domains of Health and Well-being often draws upon 'models of explanation in medicine, concepts of health and disease, clinical judgment, as well as the meaning of human dignity, the definition of death, or the significance of beneficence, virtue, and consensus' (Meacham, 2015). However, these debates often start reasoning from out of the medical, or the social model of disability, which emphasize the context of 'human enhancement' (medical model) or 'corporeal surroundings' (social model) (Retief & Letšosa, 2018) of the disabled body. These models regard the disabled body as being inferior (medical model) or as something to be ignored (social model; Barnes et al., 2010)). The disabled body has been studied for centuries through a Humanistic perspective, which poses rationality to the forefront of the scientific process. This work, influenced by Anglo-American thinkers, such as Popper (falsifiability), Kuhn (paradigms) and Lakatos (research programs) rely on objectivist viewpoints to produce knowledge and work from a disciplinary perspective (Chimisso, 2006; Darwin, 2010; Walker, 2010). In the Humanist worldview, disciplinary structures are operating separately, and researchers are often driven towards choosing one of these structures to move forward in the scientific process. This could potentially have supported the objectification and further pathology of the disabled body, since the influential medical model emphasized on determining law & principles (Major Science) rather than questioning and investigating the relationship that these disciplines have to themselves (Minor Science). However, knowledge production in the 21st century can no longer be created only through one disciplinary structure. In contrast to the search for objectivity and universality in the scientific process, the deployment of the posthumanistic worldview, as described in French philosophy of science by famous philosophers Deleuze, Guattari, and Foucault, bases its worldview on relationality rather than rationality. This paves the way for a pluralistic, relational, and expansive way of thinking in design and design practices (Marenko & Brassett, 2015). For the intersection of HInt and CDS, this can be translated towards a design epistemology that emphasizes nomadic design practice without fixed borders. Design practices on the intersection of HInt and CDS revolve around 'making hacks into reality' (Von Busch et al., 2022), and make use of a kind of 'designerly realism' (Von Busch & Palmås, 2023) to explore, unveil and excavate power relations shaping the production and dissemination of knowledge, and vice versa, knowledge production in turn shapes and reinforces those power relations as well. These design practices look like a intertwined spectacle of 'competitor, allied, non-allied, collaborative, competitive, contradictory or aligned practices of design' (Wakkary, 2020), that result in new fluid politics which operate 'in composition' rather than 'organization'.

CONNECTIVITY – Posthumanist epistemology in design

The posthumanistic epistemology in design (Wakkary, 2020) emphasizes nomadic practices that move beyond the fixed borders of the disciplines of Disability Studies or Human-Computer Integration, and situate in specific places, dealing with embodied encounters and unexpected contingencies.

Posthumanistic epistemology in design

Bodies matter, in 'the fleshiness of the world which inhabits us and is inhabited by us' (Merleau-Ponty, 2012). The experience of partnership in the fragile, sensitive, and intimate characteristics of deviant embodiment with its technological instrument 'constitutes the self' (Shildrick, 1997, 2009; Shildrick & Söffner, 2017). To comprehend the kinds of qualities that can be found in the paradigm shift from Interaction towards Integration, we need to think about different ways of looking at knowledge, practices, techniques, design tools and methods - the 'dispositifs' (Deleuze, 1992; Marenko & Brassett, 2015) - through which our bodily 'becoming-in-the-world' (Shildrick, 2009) is formed. In short, *how* we come to 'matter'. This 'matter(ing)' - represented in the 'active forms and repertoire for how it plays' (Mitchell et al., 2019) - can be seen as a body of knowledge - 'learned by doing' - that is al-

ready well-developed in Critical Disability Studies. The daily encounters of resistance to power and dependency, as well as the daily grappling with the gritty (painful, (Siebers, 2015)) and messy (pleasurable, (Shildrick, 2009)) materiality of the disabled body can be seen as knowledge about the relation of human *difference* to social organization and human perception (Siebers, 2015; Mitchell et al., 2019). A society that wants the disabled person to 'pass' (through playing roles) or 'masquerade' (through disguising the disability) their difference (Mitchell et al., 2019) potentially does not shy away from the same mechanisms when Human-Computer Integration becomes part of everyday life. The institutional, physical, and administrative mechanisms (Deleuze, 1992) are important because our bodies become part of the systematic assemblages that affect how our bodies and minds develop. Rather than pursuing design to be just about the physical world around us, it also encounters the way we interact with that world through language and ideas. New politics of fluidity could come out of the possible question how deviant embodiment – meaning the alteration of human characteristics and capabilities - is treated in relation to 'complex embodiment' – meaning disability materiality and its 'the fruits of the interaction between body, mind and environment' (Siebers, 2015).

CREATIVITY – Somatechnics and Soma Design

Although Somatechnics is not directly linked to its pragmatic counter half Soma Design in HCI, these disciplines do relate. Therefore, we state that these disciplines should move beyond their own existences and get involved in each other's body of knowledge, assemblage, and reality-making to embrace the high-end potential for knowledge production that can result out this.

Deviant and complex embodiment in Somatechnics and Soma Design

Somatechnics, as explored in Critical Disability Studies, is used to re-imagine the embodiment of technobodies (Verhoeff & Van Der Tuin, 2020) through 'multifarious ways in which embodiment exceeds established boundaries and meshes with non-human entities' (Shildrick, 2022). 'Tekné' refers to ways of seeing, knowing, feeling, moving, being, and acting in situated contexts through the body structures and 'active forms of interplay' (Easterling, 2012) of the embodied subject, including practices such as politeness, elegance, poetry, and language. Somatechnics critically engages with the ethico-political implications of a wide range of practices and techniques (Shildrick, 2022) and emphasizes the importance of understanding the body in relation to the materialities of the world. It calls for 'a recognition of the body in the world as an artifact wrapped up, entangled and produced by the materialities of that world' (Sullivan, 2012). In HCI, the design practices of Soma Design (Höök, 2018), 'soma' can be recognized as the unity of mind and body, intellect and experience, and Soma Design Theory engages in experimental activities that 'will always depend on the affordances of the technologies and materials used to shape the designs (Höök, 2018). Soma Design has interaction design at its base, meaning that 'it is always the study of the socio-digital material: the coming together of people with designed interactive artifacts and the behaviors and experiences generated in the combined material of people, practices, tools and design.' Both Somatechnics and Soma Design emphasize the transformative relationships between the body, environment, and materiality, and exemplifies the unique knowledge that arises from interactions in the 'enmeshment of body-material and environment-material' (Mitchell et al., 2019). A shared focus on the complexities in deviant embodiment, whether represented in Critical Disability Studies or Human-Computer Integration, could potentially teach us how to design for artefacts that bring something new to the world that may otherwise go unrecognized (Mitchell et al., 2019).

Conclusion

In this paper we explored the intersection of Human-Computer Integration (HInt) and Critical Disability Studies (CDS), to learn how this intersection can become a catalyst for innovation in Health and Well-being. Human-Computer Integration (HInt) shifts the focus away from the 'stimulus-response' model of HCI towards integral relationships between humans and computers. As this emerging paradigm shift has more to do with 'becoming-in-the-world' than with 'being-in-the-world', the contingency of its existential-ontological evaluation, requires a rethinking in the philosophy of sciences is necessary to establish alternative ways of knowledge production which move away from the Enlightenment perspective and engage with a posthumanistic epistemology in design, which produces knowledge and know-how through nomadic practice beyond the fixed borders of the disciplines of Disability Studies or Human-Computer Integration. The body of knowledge that emerges from the interconnected disciplines potentially results in new fluid politics operating with situatedness and embodied repertoires and contingency. The symbiotic partnerships of humans and computers, which is embedded in Human-Computer Integration, will be studied in design practices, and be intertwined with the matter and 'mattering' of disability materiality. The compatibility of HInt and Critical Disability Studies is further explored in the disciplines of Somatechnics and Soma Design which can produce transformative knowledge for both Critical Disability Studies and Human-Computer Integration through a shared focus on deviant embodiment.

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References

Andres, J., Semertzidis, N., Li, Z., Wang, Y., & Floyd Mueller, F. (2022b). Integrated Exertion — Understanding the Design of Human–Computer Integration in an Exertion Context. *ACM Transactions on Computer-Human Interaction*. 29, 6, Article 55 (jan 2023), 28 pages. https://doi.org/10.1145/3528352

Barnes, C., Mercer, G. & Shakespeare, T. (2010). 'The social model of disability', in A. Giddens & P. Sutton (eds.), *Sociology: Introductory readings, 3rd edition*., pp. 161–166, Polity Press, Cambridge.

Braidotti, R. (2016). The Contested Posthumanities. In R. Braidotti & P. Gilroy (Eds.). *Conflicting Humanities* (pp. 9–46). London: Bloomsbury Academic. Retrieved January 20, 2023, from http://dx.doi.org/10.5040/9781474237574.ch-001

Braidotti, R. (2006). Posthuman, All Too Human: Towards a New Process Ontology. *Theory, Culture Society 23* (2006), 197–208. Issue 8. https://doi.org/10.1177/0263276406069232

Braidotti, R. (2013). Posthuman Humanities. *European Educational Research Journal*. 12 (1): 1–19. https://doi.org/10.2304/eerj.2013.12.1.1 ISSN 1474-9041.

Busch von, O., Dilnot C., and Staszowski E. (2022). *Making Trouble*. Bloomsbury Academic.

Busch von, Palmås, K. (2023). *The Corruption of Co-Design* (1 ed.). Routledge.

Danry, V., Pataranutaporn, P., Haar Horowitz, A., Strohmeier, P., Andres, J., Patibanda, R., Li, Z., Nakamura, T., Nishida, J., Lopes, P., León, F., Won, A. S., Svanæs, D., Mueller, F. F., Maes, P., Leigh, S. W., & Semertzidis, N. (2021). Do Cyborgs dream of Electric Limbs? *Experiential Factors in Human-Computer Integration Design and Evaluation. Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems*, 1–6. https://doi.org/10.1145/3411763.3441355

Deleuze, G. (1992). *What is a dispositif*. Michel Foucault: Philosopher, 159, 168.

Easterling, K. (2012). We Will Be Making Active Form. *Architectural Design* 82, 5 (2012), 58–63. https://doi.org/10.1002/ad.1461

Farooq, U., & Grudin, J. T. (2017). Paradigm shift from human computer interaction to integration. *Conference on Human Factors in Computing Systems - Proceedings Part F127655*, 1360–1363. https://doi.org/10.1145/3027063.3049285

Goodley, D. (2017). *Disability Studies: An Interdisciplinary Introduction*. SAGE Publications.

Höök, K. (2018). Designing with the Body. Amsterdam University Press, Amsterdam, Netherlands.

Höök, K. et al. (2019). Soma Design and Politics of the Body. In *Proceedings of the Halfway to the Future Symposium 2019 (Nottingham, United Kingdom) (HTTF 2019). Association for Computing Machinery*, New York, NY, USA, Article 1, 8 pages. https://doi.org/10.1145/3363384.3363385

Keane, N. (2015). On the Origins of Illness and the Hiddenness of Health: A Hermeneutic Approach to the History of a Problem. *Springer* EBooks, 57–72. https://doi.org/10.1007/978-94-017-9870-9_4

Licklider, J. C. R. (1960). Man-Computer Symbiosis. *IRE Transactions on Human Factors in Electronics HFE-1* (3 1960), 4–11. Issue 1. https://doi.org/10.1109/THFE2.1960.4503259

Marenko, B., & Brassett, J. (2015). *Deleuze and Design*. Edinburgh University Press EBooks. https://doi.org/10.1515/9780748691555

Meacham, D. (2015). *Medicine and Society, New Perspectives in Continental Philosophy*. Springer.

Merleau-Ponty, M. (2012). *Phenomenology of perception*. Donald A. Landes. Abingdon, Oxon: Routledge. ISBN 978-1-135-71860-2. OCLC 841171178.

Mitchell, D.T., Antebi, S., Snyder, S.L. (2019). *The Matter of Disability: Materiality, Biopolitics, Crip Affect*. University of Michigan Press.

Mitchell, D.T., Snyder, S.L. (2015). *The Biopolitics of Disability: Neoliberalism, Ablenationalism, and Peripheral Embodiment*. University of Michigan Press. http://www.jstor.org/stable/10.3998/mpub.7331366

Mueller, F. F., Lopes, P., Strohmeier, P., Ju, W., Seim, C., Weigel, M., Nanayakkara, S., Obrist, M., Li, Z., Delfa, J., Nishida, J., Gerber, E. M., Svanaes, D., Grudin, J., Greuter, S., Kunze, K., Erickson, T., Greenspan, S., Inami, M., . . . Maes, P. (2020). Next Steps for Human-Computer Integration. *Conference on Human Factors in Computing Systems - Proceedings*. https://doi.org/10.1145/3313831.3376242

Mueller, F. F., Lopes, P., Andres, J., Byrne, R., Semertzidis, N., Li, Z., Knibbe, J., & Greuter, S. (2021). Towards understanding the design of bodily integration. *International Journal of Human Computer Studies 152* (8 2021). https://doi.org/10.1016/j.ijhcs.2021.102643

Murray, S. (2020). *Disability and the Posthuman: Bodies, Technology, and Cultural Futures*. Liverpool University Press.

Otto, E., & Rössler, P. (2019). *Bauhaus Bodies: Gender, Sexuality, and Body Culture in Modernism's Legendary Art School*. Bloomsbury Publishing USA.

Retief, M. and Letšosa, R.. 2018. Models of disability: A brief overview. *HTS Teologiese Studies / Theological Studies* 74, 1 (2018), 8. https://doi.org/10.4102/hts.v74i1.4738

Shildrick, M. (2022). *Visceral Prostheses: Somatechnics and Posthuman Embodiment*. Bloomsbury Publishing.

Shildrick, M., Söffner, J. (2017). *Border Crossings: The Technologies of Disability and Desire*. Transcripts Verlag. http://www.jstor.org/stable/j.ctv1xxs3r.12.

Shildrick, M. (2009). *Dangerous Discourses of Disability, Subjectivity and Sexuality*. Palgrave Macmillan.

Shildrick, M. (1997). *Leaky Bodies and Boundaries: feminism, postmodernism and (bio) ethics*. Routledge Publishing.

Semertzidis, Nathan Arthur; Fang, Zoe Xiao; Lopes, Pedro; Kunze, Kai; Pangaro, Paul; Mueller, Florian Floyd; Maes, Pattie (2022-04-28). "What We Talk About When We Talk About Human-Computer Integration". *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems*. CHI EA '22. New York, NY, USA: Association for Computing Machinery: 1–4. https://doi.org/10.1145%2F3491101.3516509. ISBN 978-1-4503-9156-6.

Turner, V.W., Abrahams, R.D., Harris, A. (2011). *The Ritual Process: Structure and Anti-Structure*. Aldine Transaction.

Siebers, T. (2015). *Disability and the Theory of Complex Embodiment* — For Identity Politics in a New Register.

Sullivan, N. (2012). The somatechnics of perception and the matter of the non/human: A critical response to the new materialism. *European Journal of Women's Studies* 19,3(2012),299–313. https://doi.org/10.1177/1350506812443477 arXiv:https://doi.org/10.1177/1350506812443477

Verhoeff, N., & Van Der Tuin, I. (2020). Interfaces (for) Diffracting Technobodies: A Science-Humanities-Design Perspective for an Algorithmic *Somatechnics*. Somatechnics, 10(3), 374–396. https://doi.org/10.3366/soma.2020.0328

Wakkary, R. (2020). Nomadic practices: A posthuman theory for knowing design. Eindhoven University of Technology Research Portal. https://research.tue.nl/en/publications/nomadic-practices-a-posthuman-theory-for-knowing-design

Wolfe, C. (2013). *What Is Posthumanism?* University of Minnesota Press.

Did you know that... the many traumatized and disabled veterans returning from WWI resulted in more acceptance of disabled people participating in the workforce? Also, the famous Bauhaus model (Otto & Rössler, 2019) originated from the idea that this educational model would make it possible for a heterogenous group of artists, designers, craft-makers to learn together, despite their different backgrounds and WWI traumas. Bauhaus' emphasis on 'making' and materiality redefined what design can do for society amidst the leftover anxieties and revolts of the past.