Evaluating ADHD Users' Experience with Commercial Recommender Systems

Sushmita Khan
Clemson University
Clemson, South Carolina, USA
sushmik@clemson.edu

Bart Knijnenburg
Clemson University
Clemson, South Carolina, USA
bartk@clemson.edu

Emma Dixon
Clemson University
Clemson, South Carolina, USA
eschare@clemson.edu

ABSTRACT

Although there is a significant increase in research on the user experience of recommender systems, they do not delineate varied experiences based on cognitive abilities. In this paper, we evaluate the impact of recommender systems on users with the neurodevelopmental classification of Attention Deficit Hyperactivity Disorder (ADHD). Through constructivist grounded theory analysis of six contextual interviews, we formulate an initial theory explaining how personalized recommendations exacerbate ADHD users' self-regulatory challenges leading to overarching detrimental consequences in ADHD users' interpersonal lives. Furthermore, though participants found community and social support through personalized recommendations, the challenges of personalized recommendations outweighed the benefits.

CCS CONCEPTS

• **Computing methodologies → Artificial intelligence**; • **Human-centered computing → Accessibility design and evaluation methods**; **Accessibility design and evaluation methods**;

KEYWORDS

Recommender System, User Experience, Attention Deficit Hyper Activity Disorder

1 INTRODUCTION

Recommender systems curate content to users' preferences to maximize interaction, increase time spent on the platform, and increase revenue [21]. In recent years, there has been a significant increase in research on the user experience of such systems [18]. However, past research does not delineate users' experiences based on their cognitive abilities [28]. Individuals with varying cognitive abilities, also referred to as neurodivergent, make up for approximately 20% of the global population [29]. Neurodiversity refers to the spectrum

of neurodevelopmental classifications that encompass diverse and unique cognitive abilities [30]. Neurodiversity is the diversity of neurological makeup, cognitive processing or cognitive styles. Thus, users' experiences shaped by their cognitive ability may not be generalizable to experiences shaped by a different cognitive ability, and it is, therefore, important to understand users' experiences respective to their cognitive abilities [13]. Unfortunately, the dearth of work addressing the requirements of neurodivergent recommender system users means that the experiences of this significant proportion of the user population remain largely unaccounted for. In addition, the lack of work that specifically trains and tests recommender systems with neurodivergent users can cause a significant mismatch in recommendation accuracy, thereby posing further challenges to users with cognitive or intellectual disabilities [11].

In this paper, we focus on the neurodevelopmental classification of Attention Deficit Hyperactivity Disorder (ADHD). ADHD being a covert disability implies that ADHD people experience heightened ableism [13] and are one of the most stigmatized and overlooked communities [28]. In our study, we evaluate ADHD users' experiences with re commender systems and personalized recommendations to begin to answer the following research question: *What impact, if any, do Recommender Systems have on ADHD users'?* We employed a three-stage user-centered design method [5] and conducted contextual interviews, codesign, and design critique sessions with six participants. We report on our preliminary analysis of the contextual interview sessions eliciting recommender systems both assisting and exploiting ADHD users' cognitive abilities.

2 RELATED WORK

ADHD people are often overlooked as end users of ubiquitous technologies. They are usually not explicitly consulted when designing or testing systems [25]. Even systems that are designed with and for ADHD people are predominantly designed with and for ADHD children and their caregivers (as in [26] and [12]). Such systems are usually diagnostic technologies (rooted in the concept of detecting hyperactivity) or assistive technologies (which aim to support the medical deficits of ADHD) [14, 22, 28]. However, many assistive technologies have been found to amplify depression and suicidal ideation among ADHD individuals [4, 10, 24].

Beyond diagnostic and assistive technologies, more research is needed on how adaptive technologies, in general, impact people with disabilities [11]. While user-centered evaluation of recommender systems (for example [19]) has led to improved user experiences through algorithmic and interface advancement [6, 16], these evaluations do not delineate users' experiences with respect to their cognitive abilities. More specifically to the topic of the

current paper, there is a dearth of knowledge about ADHD adults' experiences with commercial technology with respect to their cognitive abilities [28]. For example, one could conjecture that for ADHD users, who often have trouble focusing on a single task, may find personalized recommendations of a specific topic a welcoming experience. Conversely, one could argue that personalized recommendations around users' short-term interests rather than their long-term goals [7, 17], would actually be detrimental to ADHD users. Furthermore, people with varying cognitive abilities may require different strategies for navigating homogeneous personalized recommendations when needed. This lack of knowledge, coupled with the neuro-normative narrative in ubiquitous technology [28] that fails to conceptualize ADHD people or users with any cognitive disability as a distinct user group, is detrimental to the lives of this sizable population of users.

To counteract the harmful effects of behaviorist and neuro-normative technological design, it is imperative to understand ADHD users' experiences and needs from commercial technology, including recommender systems-powered applications like social media, e-commerce, etc. Existing studies in this area neither reflect on implications nor propose design solutions with respect to users varying cognitive abilities. We identify this as a potential research gap. To address the research gap, we conceptualize ADHD people as end-users and aim to understand whether their experience with recommender systems is shaped by their unique cognitive abilities. To that effect, we evaluated ADHD users' experiences with pervasive recommender systems to identify their needs and understand recommender systems' impact on their lives.

3 METHODS

To evaluate whether recommender systems are inclusive of ADHD users' needs, we conducted a series of contextual interviews with ADHD users, asking them to recount their experiences with commercially available recommender systems. We recruited six adult participants via snowball sampling (upon IRB approval), conducted a remote hour-long contextual interview session with each participant, and compensated each participant with a 25 USD Amazon gift card. All sessions were conducted and recorded via Zoom. Table 1 presents key participant demographics. We assign pseudonyms to each participant to humanize our presentation while ensuring participant anonymity. Pseudonyms were generated through a random name generator.

3.1 Contextual Interview

We conducted six contextual interviews to learn about participants' interaction behavior to better understand their needs as it relates to information consumption and decision-making, impulsivity, self-regulation and/or executive function, hyper-focusing, and sense of time and memory [8, 9, 15]. We blended observation and open-ended questions in the context of the participant's recommender system use. To learn about participants' interaction behavior, we asked them to share their screens on the call and search for an item or content they liked on their preferred recommender system platform (e.g., YouTube, Amazon, Netflix). Then, we asked them to select one of the searched items (for example, add a product to a cart or watch a video) and choose a recommended item

as it appeared on the subsequent page. Simultaneously, we asked participants about their decision-making process and information consumption when presented with multiple personalized recommendations. We also asked participants about their perceptions of the personalized recommendations, probing to understand ways such systems are supporting or exploiting ADHD behaviors, including self-regulation, hyperfocusing, impulsivity, and their sense of time and memory.

3.2 Data Collection and Analysis

We conducted one contextual interview of around an hour with each of the six participants, resulting in six hours of data. We recorded all sessions (upon participant consent) and saved them on a secure server. We used constructivist grounded theory for data analysis [2], analyzing the data after each contextual interview and adapting the interview protocol to probe deeper into the emerging themes. Through an iterative process of inductive coding, memoing, and discussion between the authors, a theory of exploitation of ADHD users' unique characteristics by recommender systems emerged. For the development of this manuscript, we extracted only the most compelling quotes from interview transcripts to succinctly describe a theory.

4 FINDINGS

We present findings on participants' experience finding community and support systems through recommender systems-powered platforms, as well as our emerging theory, which explains how recommender systems exploit ADHD users' unique characteristics and the adverse effect this exploitation can have on their well-being. On the positive side, we see that ADHD users may benefit from personalized recommendations as a means of finding community.

Participants in our study report finding community and support systems in recommender systems-powered platforms like TikTok, Instagram, Reddit, and even YouTube. Indy (P1) and Maya (P3) report coming across *"ADHD tiktok"* where they found support and validation. Participants also shared how watching other ADHD users' videos was an avenue to recognize their own needs, talk to and share experiences with like-minded people and provide a source of comfort, as depicted by the following quote:

> "it also made me feel a little bit less alone" – Indy (P1)

Although participants found community and support through recommender system-based applications, they also reported the challenges outweighed the benefits. We elaborate on these challenges below.

4.1 Preliminary Theory

Our emergent theory, characterized in figure 1, unfolds in four phases. In the first phase, we see that personalized recommendations exploit ADHD users' self-regulatory processes. Self-regulation refers to adapting one's behavior, emotions, and thoughts with respect to one's longer-term goals and is essential in all stages of life [3]. When presented with personalized recommendations (which are usually optimized to create an attractive short-term gain or benefit, for which ADHD users' have a predisposition [23]), ADHD users are unable to adapt their behavior, emotions, and thoughts with respect to their long-term goals, instead giving in to

Pseudonym and Participant ID	Gender	Ethnicity	Age	Occupation
Indy (P1)	Woman	White	24	High School Teacher
Lily (P2) P2	Woman	Black	45	Elementary School Teacher
Maya (P3)	Woman	White	24	Graduate Student
Bo (P4)	Man	South Asian	28	Lawyer
Dan (P5)	Man	Pacific Islander	27	Graduate Student
Jojo (P6)	Man	Black	28	Engineer

Table 1: Participant Demographics

the short-term gratification that they enjoy from interacting with such personalized recommendations.

Once the recommendations breach ADHD users' self-regulation process, we find that ADHD users tend to hyper-focus on the stream of personalized recommendations; this is the second phase in our theory. Hyper-focusing is a state of intense concentration or focus where individuals do not consciously perceive unrelated external stimuli. To engage in hyper-focusing, a person has to enjoy the activity [1]—the recommendations on most existing platforms tend to be optimized for such enjoyment. This leads to phase three, where we see the effects of ADHD user's state of hyper-focus on personalized recommendations: the state of hyper-focus compromises ADHD users' control over their working memory (making them unable to refocus their short-term goals on the task they set out to do) and reduces their awareness of time (making them not realize how much time they have spent interacting with personalized recommendations). While ADHD users often learn to recognize the state of hyper-focus, its occurrence is usually not without consequences (phase four of our emerging theory): Upon recognizing and reflecting upon the hyper-focusing episode, ADHD users experience self-loathing. If they frequently and/or extensively hyper-focus on personalized recommendations, this may result in career setbacks or relational strife, which is the last phase of our emerging theory.

4.2 Evidence for Phase 1: How Recommendations Exploit Self-Regulation

All participants said they almost always engage with seemingly exciting recommendations regardless of their schedules or commitments. Upon coming across enjoyable recommendations, participants inadvertently prioritized engagement with the recommendation over their long-term goals (for example, the task they set out to complete). This is indicative of impaired self-regulatory processes, as participants' responses elicit their struggles to adapt their behavior and thoughts with respect to long-term goals.

" I'm saying like these things will send me so far. I'm looking into dresses for like a wedding that doesn't exist. I don't know how to stop." – Indy (P1)
"it's harder to say no to something when you have a neurological need for it. It makes it 20 times harder for me to say No, you know." – Maya (P3)

4.3 Evidence for Phase 2: How Compromised Self-Regulation Leads to Hyper-Focusing

Once participants began interacting with the recommended items, they were likely to continue their interaction. Through a stream of enjoyable recommendations, the recommendation feedback loop stimulates participants to hyper-focus. Participants found themselves hyper-focusing on the recommendation feedback loop without realizing they had been in a state of intense concentration.

"So I watched the video, and I saw [tamagachi] on sale. And then I went and looked, okay. Is there any good [place]. And then I went, What other kinds [of tamagachi] are there? Where are they manufactured? How does the code work? How do they communicate with each other? And within a 2 week period I basically was off the grid and stopped responding to messages or doing anything." – Dan (P5)

4.4 Evidence for Phase 3: Consequences of Hyper-Focusing

Participants informed us about losing the sense of time when in a state of hyper-focus. By the time the participants were aware of their state of hyper-focus, they struggled to recall their long-term goal, such as their intended task prior to the hyper-focus state. Participants' recounts are consistent with the medical classification of how ADHD people conceptualize time and manage their working memory.

"it is really a rabbit hole... by the time I realized what I am doing, I have already forgotten why I was here to begin with! So now I have spent who knows how many hours, did not finish my work or can no longer remember why I am here!" – Indy (P1)

4.5 Evidence for Phase 4: Effects in Personal Life

Participants told us that upon recognizing that they have been hyper-focused, they experience amplified feelings of debilitating self-loathing. Debilitating feelings include feeling frustrated or blaming themselves because they did not *"self regulate despite knowing better"* – *Indy (P1)* to prevent hyper-focusing. Furthermore, participants said that at the height of their frustration, they compare themselves to other people and continue to blame themselves, feel intense shame, and consider themselves *"stupid"* – *Bo (P4)*, or *"lazy and unproductive"* – *Dan (P5)*
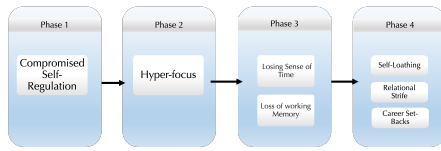
Figure 1: A visualization of our emergent theory on how recommender systems affect ADHD users.

> "I tell myself that a functioning adult should not be doing that. I feel pretty stupid. I do care because I'll pay for it the next day, you know" – Bo (P4)

Participants also told us that recommender systems exploiting their self-regulation have over-arching adverse effects in their lives. Adverse effects include impacts on their health and wellness, work and career, and interpersonal relationships, as depicted by the following quotes:

> "Now there are times when I get too engrossed in the video, and instead of sleeping I keep watching to 3[AM], 3:30[AM], and I have to wake up at 7:30[AM] every morning for work and I dearly regret that I dearly regret doing that but…" – Bo (P4)
> "Tiktok, was definitely the thing that was the hardest for me to get off of, which is why eventually I've had to uninstall it. I'm like I can't. This is detrimental to my health and my sanity." – Dan (P5)
> "Me and my girlfriend were watching a TV show. And then [I like I] if I miss something she'll get mad because she's like, if you get off your phone and pay attention. Then all that stuff. And I'm like, Oh, goodness, yeah. And then that's usually when it hits me. I'm like, Okay" – Jojo (P6)

To summarize, recommender systems exploit ADHD users' self-regulatory processes. This exploitation creates a domino effect of events (figure 1), resulting in intense self-loathing and over-arching detrimental effects on their lives and well-being.

4.6 Coping Mechanisms

Participants had developed their unique coping mechanism to support self-regulation, state of hyper-focus, and sense of time. Indy (P1) and Maya (P3) reported using a timer for every task they do throughout the day, including using recommender systems. Dan (P5) and Jojo (P6) found social accountability most helpful and therefore relied on his social support. Maya (P3) also adhered to a very strict schedule and would only allow herself a certain amount of time on any recommender systems-powered platform. Finally, Indy (P1), Lily (P2), Maya (P3), and Dan (P5) uninstalled recommender system-powered apps (for example, Tiktok) as a coping mechanism. Despite developing their unique coping mechanisms, participants' general sentiment was that life would have been less challenging without the negative emotions due to the exploitation of their neurodivergence.

5 DISCUSSION

Through a constructivist grounded theory analysis of six contextual interviews with ADHD people, we present empirical evidence of how individual users' cognitive abilities shape their experiences and use of technology. We present the implications of our findings in the rest of this section.

Our findings reveal ADHD users' dichotomous experience with recommender systems. On the one hand, our participants found community and social support due to personalized recommendations. On the other hand, personalized recommendations exploited participants' self-regulation process, which detrimentally affected their day-to-day lives. However, participants find recommender systems exploitation outweighs the benefits of social support.

ADHD users' dichotomous experience with recommender systems brings to light the necessity of future research and development to conceptualize end users' cognitive abilities when developing technological systems, including recommender systems. A potential avenue for refining extant commercial recommender systems could include efforts to balance social support, and exploitation could be to train and test recommender systems with data reflecting cognitive and intellectual disabilities [11].

In this paper, we demonstrated how ADHD users' experiences vary from the user experiences reported in extant literature. These findings show that overlooking ADHD users as end-users is detrimental to the well-being of this sizable user group. Consistent with [20, 27, 28], we recognize that to resolve these issues, it is imperative to not only conceptualize ADHD as end-users but also involve them in the design and development of future recommender systems.

This study brings to light that cognitive abilities shape users' technology experience. Additionally, consistent with previous research, we find that the neurotypical narrative underlying the design of prevalent technologies has a detrimental effect on neurodivergent users' online and offline well-being [28]. As such, another potential avenue for future work could focus on evaluating and extending extant user experience framework (for example [18]) or developing frameworks to evaluate user experience with respect to cognitive abilities.

Our emergent theory suggests ADHD users find personalized recommendations exploitative to their self-regulation processes. Exploited self-regulation unfolds a sequence of events as shown in figure 1. Our theory could help guide the development of inclusive features. First, as we find that compromised self-regulation is the starting point, future studies could potentially investigate algorithmic and user interface improvements to circumvent personalized recommendations exploiting self-regulation. Second, future research could investigate mechanisms of aiding with states of hyper-focusing through a series of external stimuli (notifications) administered over a period of time. External stimuli provide several prospective future research: testing to identify the optimal intensity of external stimuli to that ADHD users respond to when hyper-focusing, using external stimuli in short-term goals completion, and helping ADHD manage time.

The findings of this paper comprise a preliminary theory (figure 1) delineating the effects of recommender systems on ADHD users. As these findings are based on experiences reported by six ADHD users, future work is needed to further investigate the potential adverse effects of recommender systems on ADHD users, as well as tease out the nuances in the effects of recommender systems across various neurodivergent populations. With a more thorough

understanding of the contributing factors to exploitation by recommender systems on neurodivergent populations, researchers, technology designers, and developers will be better informed to design interventions to mitigate this exploitation.

6 CONCLUSION

We conducted contextual interviews with 6 ADHD people to evaluate ADHD users' experiences with commercial recommender systems. We find personalized recommendations help ADHD users find community and social support and simultaneously exploit the ADHD self-regulation process. Due to the compromised self-regulation, our participants have reported experiencing detrimental effects in their day-to-day lives. As such, we recommend reevaluating the design of recommender systems to accommodate users' cognitive abilities as a measure of experience and design recommender systems in collaboration with target user groups.

REFERENCES

[1] B. K. Ashinoff and A. Abu-Akel. 2019. Hyperfocus: the forgotten frontier of attention. *Psychological Research* 85 (2019), 1–19. Issue 1. https://doi.org/10.1007/s00426-019-01245-8

[2] Kathy Charmaz. 2014. *Constructing Grounded Theory* (second ed.). SAGE Publications ltd, Thousand Oaks, California.

[3] Franceli L. Cibrian, Kimberley D. Lakes, Sabrina E.B. Schuck, and Gillian R. Hayes. 2022. The Potential for Emerging Technologies to Support Self-Regulation in Children with ADHD: A Literature Review. *Int. J. Child-Comp. Interact.* 31, C (mar 2022), 15 pages. https://doi.org/10.1016/j.ijcci.2021.100421

[4] W. B. Daviss. 2008. A review of co-morbid depression in pediatric adhd: etiologies, phenomenology, and treatment. *Journal of Child and Adolescent Psychopharmacology* 18 (2008), 565–571. Issue 6. https://doi.org/10.1089/cap.2008.032

[5] Geert de Haan. 2015. HCI Design Methods: Where next? From User-Centred to Creative Design and Beyond. In *Proceedings of the European Conference on Cognitive Ergonomics 2015* (Warsaw, Poland) *(ECCE '15)*. Association for Computing Machinery, New York, NY, USA, Article 6, 8 pages. https://doi.org/10.1145/2788412.2788418

[6] Tawanna R. Dillahunt, Christopher A. Brooks, and Samarth Gulati. 2015. Detecting and Visualizing Filter Bubbles in Google and Bing. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems* (, Seoul, Republic of Korea,) *(CHI EA '15)*. Association for Computing Machinery, New York, NY, USA, 1851–1856. https://doi.org/10.1145/2702613.2732850

[7] Michael D. Ekstrand and Martijn C. Willemsen. 2016. Behaviorism is Not Enough: Better Recommendations through Listening to Users. In *Proceedings of the 10th ACM Conference on Recommender Systems* (Boston, Massachusetts, USA) *(RecSys '16)*. Association for Computing Machinery, New York, NY, USA, 221–224. https://doi.org/10.1145/2959100.2959179

[8] Eivind Flobak, Frode Guribye, Daniel Jensen, and Astri Lundervold. 2017. Designing data-driven interventions for mental health care. In *Proceedings of the 11th EAI International Conference on Pervasive Computing Technologies for Healthcare* (Barcelona, Spain) *(PervasiveHealth '17)*. Association for Computing Machinery, New York, NY, USA, 423–426. https://doi.org/10.1145/3154862.3154917

[9] Eivind Flobak, Daniel A. Jensen, Astri J. Lundervold, Tine Nordgreen, Li-Hsuan Chen, and Frode Guribye. 2018. Towards Technology-Based Interventions for Improving Emotional and Cognitive Control. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems* (, Montreal QC, Canada,) *(CHI EA '18)*. Association for Computing Machinery, New York, NY, USA, 1–6. https://doi.org/10.1145/3170427.3188603

[10] E. Fuller-Thomson, R. N. Rivière, L. Carrique, and S. Agbeyaka. 2020. The dark side of adhd: factors associated with suicide attempts among those with adhd in a national representative canadian sample. *Archives of Suicide Research* 26 (2020), 1122–1140. Issue 3. https://doi.org/10.1080/13811118.2020.1856258

[11] Anhong Guo, Ece Kamar, Jennifer Wortman Vaughan, Hanna Wallach, and Meredith Ringel Morris. 2020. Toward fairness in AI for people with disabilities SBG@ a research roadmap. *SIGACCESS Access. Comput.* NA, 125, Article 2 (mar 2020), 1 pages. https://doi.org/10.1145/3386296.3386298

[12] Yasaman Hashemian and Marientina Gotsis. 2013. Adventurous Dreaming Highflying Dragon: A Full Body Game for Children with Attention Deficit Hyperactivity Disorder (ADHD). In *Proceedings of the 4th Conference on Wireless Health* (Baltimore, Maryland) *(WH '13)*. Association for Computing Machinery, New York, NY, USA, Article 12, 2 pages. https://doi.org/10.1145/2534088.2534101

[13] Megan Hofmann, Devva Kasnitz, Jennifer Mankoff, and Cynthia L Bennett. 2020. Living Disability Theory: Reflections on Access, Research, and Design. In *The 22nd International ACM SIGACCESS Conference on Computers and Accessibility* (Virtual Event Greece, 2020-10-26). ACM, New York, 1–13. https://doi.org/10.1145/3373625.3416996

[14] Hao Hu, Joey Velez-Ginorio, and Guo-Jun Qi. 2016. Temporal Order-Based First-Take-All Hashing for Fast Attention-Deficit-Hyperactive-Disorder Detection. In *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (San Francisco, California, USA) *(KDD '16)*. Association for Computing Machinery, New York, NY, USA, 905–914. https://doi.org/10.1145/2939672.2939774

[15] Jina Huh and Mark Steven Ackerman. 2010. Exploring Social Dimensions of Personal Information Management with Adults with AD/HD. In *CHI '10 Extended Abstracts on Human Factors in Computing Systems* (Atlanta, Georgia, USA) *(CHI EA '10)*. Association for Computing Machinery, New York, NY, USA, 3715–3720. https://doi.org/10.1145/1753846.1754044

[16] Sushmita Khan, Mehtab Iqbal, Nushrat Humaira, Nina Hubig, and Bart Knijnenburg. 2021. Mitigating Digital Mindlessness. *NA* NA (2021), NA.

[17] B. P. Knijnenburg, S. Sivakumar, and D. Wilkinson. 2016. Recommender systems for self-actualization. *Proceedings of the 10th ACM Conference on Recommender Systems* NA, NA (2016), 11–14. https://doi.org/10.1145/2959100.2959189

[18] B. P. Knijnenburg, M. C. Willemsen, Z. Gantner, H. Soncu, and C. Newell. 2012. Explaining the user experience of recommender systems. *User Modeling and User-Adapted Interaction* 22 (2012), 441–504. Issue 4-5. https://doi.org/10.1007/s11257-011-9118-4

[19] Bart P Knijnenburg, Martijn C Willemsen, Zeno Gantner, Hakan Soncu, and Chris Newell. 2012. Explaining the user experience of recommender systems. *User modeling and user-adapted interaction* 22 (2012), 441–504.

[20] Jennifer Mankoff, Gillian R. Hayes, and Devva Kasnitz. 2010. Disability Studies as a Source of Critical Inquiry for the Field of Assistive Technology. In *Proceedings of the 12th International ACM SIGACCESS Conference on Computers and Accessibility* (Orlando Florida USA, 2010-10-25). ACM, New York, 3–10. https://doi.org/10.1145/1878803.1878807

[21] Eli Pariser. 2011. *The filter bubble: How the new personalized web is changing what we read and how we think.* Penguin, Penguin Group (USA).

[22] Laura Pina, Kael Rowan, Asta Roseway, Paul Johns, Gillian R. Hayes, and Mary Czerwinski. 2014. In situ cues for ADHD parenting strategies using mobile technology. In *Proceedings of the 8th International Conference on Pervasive Computing Technologies for Healthcare* (Oldenburg, Germany) *(PervasiveHealth '14)*. ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering), Brussels, BEL, 17–24. https://doi.org/10.4108/icst.pervasivehealth.2014.254958

[23] N. Seaver. 2018. Captivating algorithms: recommender systems as traps. *Journal of Material Culture* 24 (2018), 421–436. Issue 4. https://doi.org/10.1177/1359183518820366

[24] M. N. Sjöberg. 2019. Reconstructing truth, deconstructing adhd: badiou, onto-epistemological violence and the diagnosis of adhd. *Critical Studies in Education* 62 (2019), 243–257. Issue 2. https://doi.org/10.1080/17508487.2019.1620818

[25] Tobias Sonne and Mads Møller Jensen. 2016. ChillFish: A Respiration Game for Children with ADHD. In *Proceedings of the TEI '16: Tenth International Conference on Tangible, Embedded, and Embodied Interaction* (Eindhoven, Netherlands) *(TEI '16)*. Association for Computing Machinery, New York, NY, USA, 271–278. https://doi.org/10.1145/2839462.2839480

[26] Tobias Sonne, Jörg Müller, Paul Marshall, Carsten Obel, and Kaj Grønbæk. 2016. Changing Family Practices with Assistive Technology: MOBERO Improves Morning and Bedtime Routines for Children with ADHD. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (San Jose, California, USA) *(CHI '16)*. Association for Computing Machinery, New York, NY, USA, 152–164. https://doi.org/10.1145/2858036.2858157

[27] Katta Spiel, Kathrin Gerling, Cynthia L. Bennett, Emeline Brulé, Rua M. Williams, Jennifer Rode, and Jennifer Mankoff. 2020. Nothing About Us Without Us: Investigating the Role of Critical Disability Studies in HCI. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu HI USA, 2020-04-25). ACM, New York, 1–8. https://doi.org/10.1145/3334480.3375150

[28] Katta Spiel, Eva Hornecker, Rua Mae Williams, and Judith Good. 2022. ADHD and Technology Research – Investigated by Neurodivergent Readers. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (, New Orleans, LA, USA,) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 547, 21 pages. https://doi.org/10.1145/3491102.3517592

[29] DCEG Staff. 2022. Neurodiversity — dceg.cancer.gov. https://dceg.cancer.gov/about/diversity-inclusion/inclusivity-minute/2022/neurodiversity. [Accessed 09-01-2024].

[30] Anna Stenning and Hanna Bertilsdotter Rosqvist. 2021. Neurodiversity studies: mapping out possibilities of a new critical paradigm. *Disability & society* 36, 9 (2021), 1532–1537.