Inclusive Conversational User Interfaces for Adults with ADHD

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Abstract
Attention Deficit/Hyperactivity Disorder (ADHD) is a highly heterogeneous neurodevelopmental condition, where those affected struggle with a variety of difficulties due to impaired levels of inattentiveness, hyperactivity, and/or impulsivity. Conversational user interfaces (CUIs) offer many potential benefits for people with ADHD, for example in regards to organization, time management and multitasking. Additionally, there is expressed a desire for development of new technologies that attend to strengths associated with ADHD. However, there is a gap in research regarding design and ADHD, especially in the field of CUI, and people with ADHD are rarely included in design processes. We report on our experiences of collaborating with adults with ADHD for design ideation and evaluation of a CUI used in an online self-help program.

Author Keywords
Conversational user interfaces; Mental health interventions; ADHD; Design workshops.

Introduction
As conversational user interfaces (CUIs), such as voice assistants and chatbots, become increasingly incorporated into our everyday lives, it is important to examine how such technology is used and experienced by marginalized and vulnerable populations. In the field of human computer in-

teraction (HCI), neurodivergent populations have received little attention, especially people with ADHD [9, 19]. We believe that CUIs offer many potential benefits for people with ADHD, but to utilize this potential we need to gain a more thorough understanding of the use and promise of CUIs for this group. In this position paper we explore this potential and report on current research on ADHD and design, and our experiences of collaborating with adults with ADHD in the design and evaluation of a peer support chatbot used in an online self-help program.

ADHD

Attention Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder recognized by impaired levels of inattentiveness, hyperactivity, and/or impulsivity [17, 1]. The condition is often associated with poor outcomes in the person's social relationships, education and/or occupational functioning [20]. ADHD is often linked to executive function difficulties, which are the mental processes used for goal-oriented thinking, behaviors and emotions [22]. People with ADHD may also experience challenges related to transitions between activities [18], perceiving time [18], sleep [6], sensory processing [16], emotional regulation [2], to mention some.

In recent years there has been increased interest in the potential positive sides of ADHD by going beyond the medical context and focus on both abilities and disabilities related to the disorder [17, 20]. In this view, ADHD is understood as a spectrum where some aspects of the disorder can be "... adaptive rather than impairing" [17, p. 241]. High levels of energy and drive, creativity, hyper-focus, agreeableness, empathy, and willingness to assist others have been reported as strengths related to ADHD [4]. Other positive attributes that are considered specific for ADHD are cognitive dynamism (constant mental activity), divergent thinking, hyper-focus, nonconformist, adventurousness, self-acceptance and sublimation (transforming socially unacceptable ideas and behavior into acceptable ones) [17].

Design, CUIs and ADHD

Detailed studies on design and user experience of people with ADHD have received limited attention [20], especially in regards to CUI design. Current design considerations for ADHD concern graphical user interfaces, and mainly children [10, 21] and assistive technologies [18]. These guidelines focus on providing structure, minimizing distraction, precise instructions and error handling, highlighting important information, and the use of praise/rewards [8, 18, 10]. Researchers, who themselves are neurodivergent (with ADHD, amongst others) [20], have examined technologies developed for people with ADHD and express a desire for new technology to attend to strengths associated with ADHD [20].

When conversations become objects of design [16], new opportunities and challenges for HCI researchers and designers arise [3], including inclusive design [8]. CUIs are often portrayed as beneficial for a wide range of disabilities, but there is little guidance on how to consider specific disabilities, such as cognitive disabilities and mental health issues [8]. Interactions through natural language can be experienced as intuitive and easy [3], and can be inclusive for less tech savant people and people with different physical disabilities. Spoken CUI technologies facilitate hands-free interactions which enable the possibility for multitasking, and can potentially decrease the cognitive effort spent on tasks [15].

Lindstedt and Umb-Carlsson report that people with ADHD appreciated cognitive assistive technology, and preferred "low-technological products such as weekly schedules" [7].

Spoken CUIs can have a potential for supporting people with ADHD, for example in regards to keeping organized by using weekly calendars and reminders, and by having their hands free for multitasking. However, there is a need to understand how we can design and tailor such features for adults with ADHD. There have been a few studies on CUIs for people with ADHD, concerning children [13, 12] and health interventions [11, 5]. In [13, 12] researchers present the design and development of a CUI aimed at supporting children with ADHD and their parents dealing with daily tasks. However, the design process is based on therapeutic models, with little focus on user experiences and design guidelines. In the health domain, CUIs have been explored as a tool for self-screening ADHD symptoms [5], and to facilitate peer support conversations between adults with ADHD who participate in an online self-help program [11]. We will now focus on the latter, where both authors of this position paper are authors.

Including People with ADHD

In a design workshop, HCI researchers, clinical psychologists and adults with ADHD, decided to explore the potential of a chatbot facilitating peer support conversations between adults with ADHD who participated in an online self-help program [11], as such conversations are an important aspect of face-to-face treatments [14]. Based on design considerations for chatbots and ADHD, a prototype was developed by HCI researchers and clinical psychologists. The chatbot worked as a mediator and guided the participants through a conversation related to content from the program. The prototype was evaluated in a field trial with adults with ADHD. Participants appreciated talking to others with ADHD, found it beneficial to discuss the content, and liked receiving praise from chatbot. Even though design choices made based on existing guidelines [18] were explicitly appreciated, there is still a need to more thoroughly explore what design guidelines are the most relevant for adults with ADHD in CUI interactions. The study is limited to the exploration of a written CUI for mental health care, and adults with ADHD were only part of the conceptual phase and evaluation. However, people with ADHD are rarely included in design processes, and we hope to inspire others to do so [7]. Even though our work did not focus on possible strengths with ADHD, we take inspiration from this notion as expressed by [20] and think this could be a valuable focus in future studies of inclusive CUI design for people with ADHD.

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