

Critical report

How can designers utilise user-centred design principles to optimise content for ADHD users?

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Abstract

The recent rise in adult ADHD diagnosis has led to an increase in information produced about the disorder. However, the way the content is designed could be improved to consider the needs of the user. This report explores and discusses user-centred design and accessibility to propose a set of user centred design guidelines for the ADHD user.

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Introduction: the rise of ADHD

In recent years the UK has seen a huge rise in adult ADHD diagnoses, especially in females. Even though there is still no national data on how many people in the UK have ADHD, it is estimated that around 4% of the population has it, with a male to female ratio of approximately 3 to 1 (Nice, 2021). The incidence of ADHD diagnosis of women aged between 23-49 has nearly doubled from 2020 to 2022 (Russell et al., 2023), and 254,400 women took an online ADHD test in 2021 (Oppenheim, 2022), which was a 3200% increase from 2019.

With the influence of social media, platforms such as TikTok have adopted an educational avenue, initiating an increase in awareness and therefore an increase in diagnoses. TikTok videos with the hashtag #ADHD, have been viewed 20.2billion times (Naish, 2023) raising awareness about the disorder, especially for women with ADHD, as their symptoms tend to get overlooked (ADDitude, 2021). This is because the differences in which male and females present their symptoms, as women tend to display more inattentive symptoms than hyperactive symptoms. In a report discussing gender differences in ADHD, it was found that “less

disruptive behaviour in females with ADHD may contribute to referral bias causing underidentification and lack of treatment for females with ADHD, [and] ...teachers more often refer boys than girls for treatment” (Skogli et al., 2013).

With this rise of awareness, adults who think they might have the disorder, along with adults who have recently been diagnosed, are seeking further information about ADHD. However, the available resources, including websites and books providing valuable information about the disorder, often fail to consider the unique needs of the key user. Fig 1 shows a double page spread from the book 'Women with Adult ADHD'. It shows a lack of structure with excessive text, long line lengths that are listed as bullet points, no hierarchy or headings. The lack of chapters makes it difficult to navigate, and the lack of colour, graphics, iconography and interactivity makes it unengaging. In the digital example (fig 2), the charity website ADHD UK displays a similar structure with listed bullet points with long structured sentences, unclear hierarchy, and no interactivity.

One of the most challenging characteristics of ADHD is having trouble with concentrating and sustaining attention, therefore, information tailored specifically for the ADHD user should consider the key users’ needs within its structure and design. This report explores and discusses how a design studio can apply user-centred design principles to understand the needs of individuals with ADHD. By understanding which symptoms and characteristics of ADHD could affect the accessibility and usability of a product and comparing these to pre-existing design solutions derived from psychology laws, a series of potential design guidelines can be proposed for designers to understand this demographic and create ADHD accessible designs.

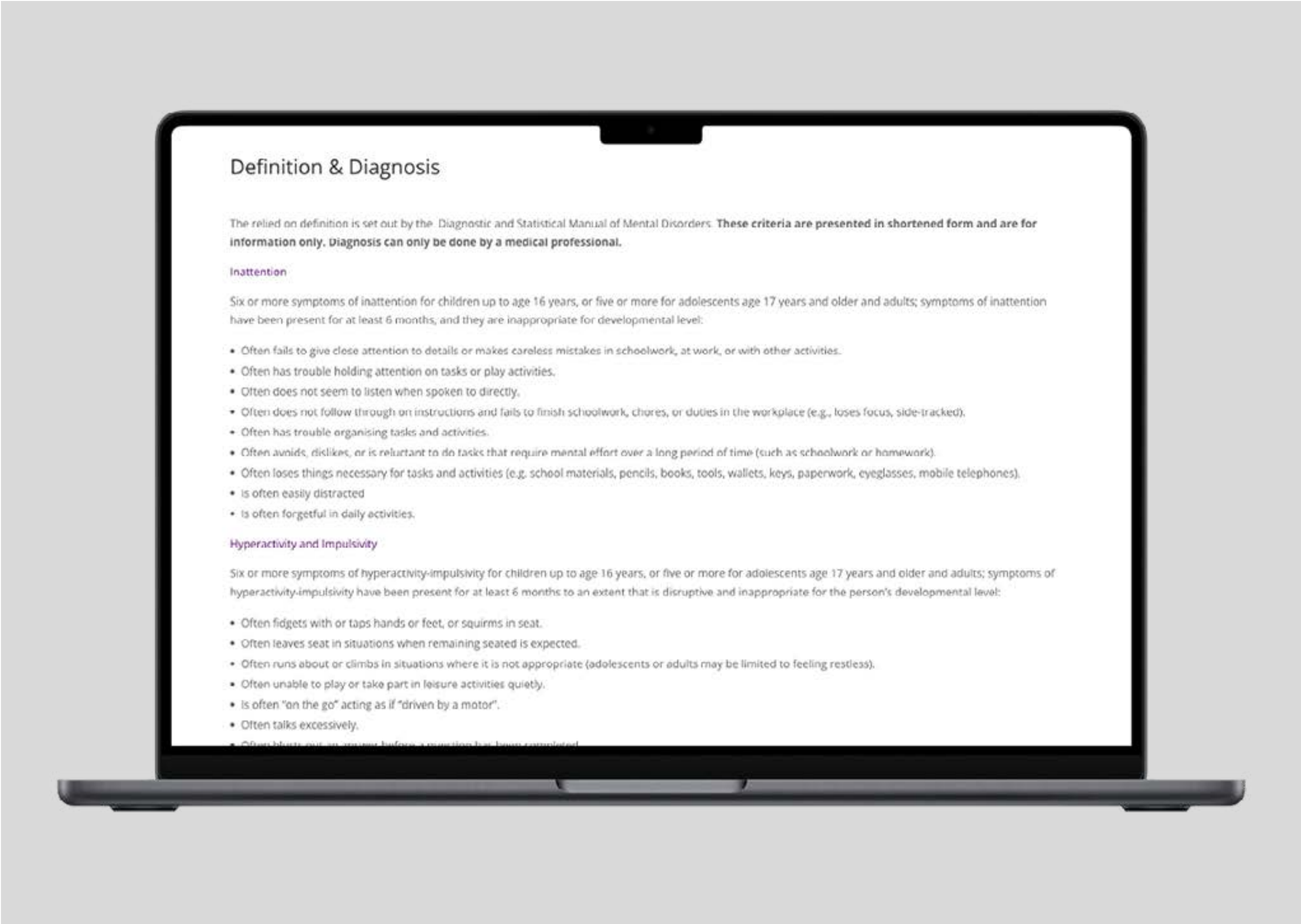


Fig. 1: Screenshot of ADHD UK website

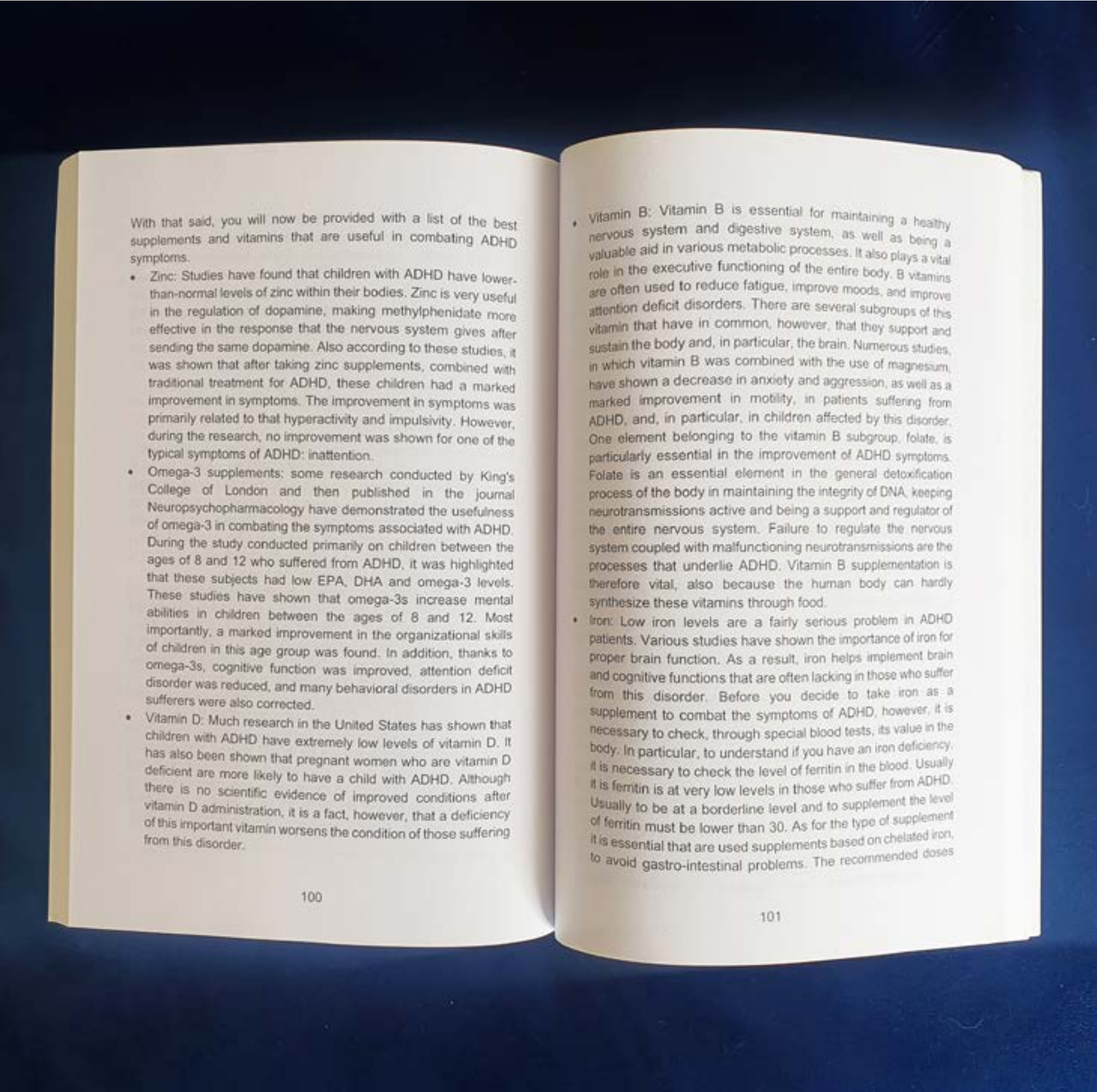


Fig. 2: Double page spread from book 'Women with Adult ADHD'

Methodology

This report will be looking at how ADHD is considered in accessibility for both digital interfaces and printed products. The research used a qualitative methodology by researching which ADHD characteristics could interfere with product usability and accessibility and finding solutions to combat these. It explores how psychology laws could be used to find design solutions based around the needs of the ADHD user and applying this to both digital interfaces and printed materials. This research will inform a new a set of proposed guidelines that designers or studios could use to understand their user.

What is ADHD?

Attention deficit hyperactivity disorder (ADHD) is a neurological disorder that impacts the parts of the brain that help plan, focus on, and execute tasks. ADHD can often be mistaken for a learning disorder, mental illness, or behaviour disorder, instead it is a developmental impairment of the brain's self-management system (ADDitude, 2023), also known as the executive functions. Executive functions are a set of higher-level cognitive processes used to control cognitive behaviours such as working memory, sustained attention, decision making, and cognitive switching (Rubia, 2018). ADHD causes an impairment in the executive functions, which creates difficulty in organisation, starting tasks, remaining engaged and focussed on tasks, and switching between tasks (The ADHD Centre, 2022).

1902 was considered the scientific starting point of the history of ADHD (Lange et al., 2010). It was originally coined hyperkinetic reaction of childhood, which the Diagnostic and Statistical Manual of Mental Disorders (DSM-II) defined as “characterized by overactivity, restlessness, distractibility, and short attention span” (Mannuzza et al., 1998). It wasn't until 1987 when they changed the name to ADHD and the three subtypes were established (Holland, 2021). These are hyperactive and impulsive, inattentive, and combined type.

Hyperactive and impulsive type

People with hyperactive and impulsive type ADHD tend to struggle to sit still, fidget a lot and can be very talkative. They may be impulsive and impatient, for example acting or speaking without thinking and finding it difficult to wait their turn (NHS, 2021). This type is more recognised in boys as they tend to externalise their behaviour (Kinman, 2016), whereas girls and women with hyperactive and impulsive type ADHD tend to express hyperactivity internally. For example, women may explain that their thoughts are racing, and they have trouble thinking about one topic at a time (CHADD, 2023).

Inattentive type

Those with inattentive type ADHD have difficulty sustaining attention, following instructions, and organising tasks. They may make careless mistakes by failing to give attention to details, become easily distracted, constantly change task or be unable to stick to tasks that are tedious or time-consuming (NHS, 2021). Girls and women predominantly exhibit inattentive symptoms as these are internalised symptoms, which can cause co-occurring conditions such as low self-esteem, anxiety, and depression (CHADD, 2023).

Combined type

Those with combined type ADHD experience 6 or more symptoms of inattention and 6 or more symptoms of hyperactivity and impulsivity. According to research, 50-75% of cases are the combined subtype (NICE, 2022).

The impact of ADHD

There are many stigmas that surround ADHD, and those who are diagnosed are at high risk of being confronted with prejudices and discrimination. The academic medical centre, Mayo Clinic, states, “Adult ADHD can lead to unstable relationships, poor work or school performance, low self-esteem and other problems” (Mayo Clinic, 2023). It is also associated with low educational achievement and poor grades (Loe & Feldman, 2007). Russel Barkley, an internationally recognized authority on ADHD, stated “students of all ages with ADHD are at risk for academic achievement problems and school failure and are less likely to complete a postsecondary education” (cited in Prevatt 2007:627), however, Barkley also found that students with ADHD tend to be above average intellectually.

In a study comparing motivational styles of children with ADHD, it was suggested that “students with ADHD learn well when they are highly interested in the material being taught, or when tasks are made salient, novel, or interesting” (Carlson et al., 2002). Therefore, it is not that those with ADHD are unable to learn, it is their ADHD symptoms, such as sustaining concentration or hyperactivity that hinder them, thus affecting their performance. Understanding that these challenging characteristics of ADHD can affect the way the user interacts and uses a product, is called user-centred design, which will inform the contents of the proposed guidelines.

UX: User Centred Design

User experience (UX) design was first coined by cognitive psychologist and designer, Don Norman, in 1995. He explains “I invented the term because I thought human interface and usability were too narrow: I wanted to cover all aspects of the person’s experience with a system, including industrial design, graphics, the interface, the physical interaction, and the manual” (cited in Stevens, 2021). The market leaders in online UX design education, Interactive Design Foundation, states “great UX = usability + graphic design + accessibility” (Interactive Design Foundation, 2022).

User-centred design (USD) is an iterative design process within the UX discipline, in which designers “focus on the users and their needs in each phase of the design process [...] to create highly useable and accessible products” (Interactive Design Foundation, 2023). USD is a process that considers the entire user experience, which includes the needs and requirements of the user, the task itself and the environment. This means the designer get a deeper sense of empathy which is essential when designing for a disability such as ADHD.

Making sure that someone with a disability can use a product is called accessibility, which is a vital part of UX design. “Accessibility is the concept of whether a product or service can be used by everyone – however they encounter it” (Interactive Design Foundation, 2022). It essentially means designing for those with disabilities and access needs, whether they are permanent or environmental. For example, “a mother holding a toddler in one arm has the same functional capabilities from a usability perspective as someone who was born with the use of only one arm” (Collins, 2022). There are 4 types of accessibility issues users may have, and these are: physical, visual, auditory, and cognitive. ADHD falls under cognitive accessibility, but this also considers other neurodivergent conditions as well as mental health conditions. Neurodivergent is a term used to describe an individual whose brain functions differently to what is considered ‘normal’, this includes ADHD, autism, Tourette’s, dyslexia and dyspraxia.

When looking for existing guidelines, there is extensive information on how to create accessible products for other neurodivergent disabilities but the information on ADHD is limited and difficult to find. ADHD tends to get paired with guidelines on autism, even though these are very different disabilities. For example, those with ADHD have difficulty regulating attention and focus, which is a key issue to consider when designing for the ADHD user, however, this is not a symptom of autism. On the gov.uk website there are detailed design frameworks on accessibility (fig 3). The neurodivergent conditions dyslexia and autism are included; however, ADHD is not.

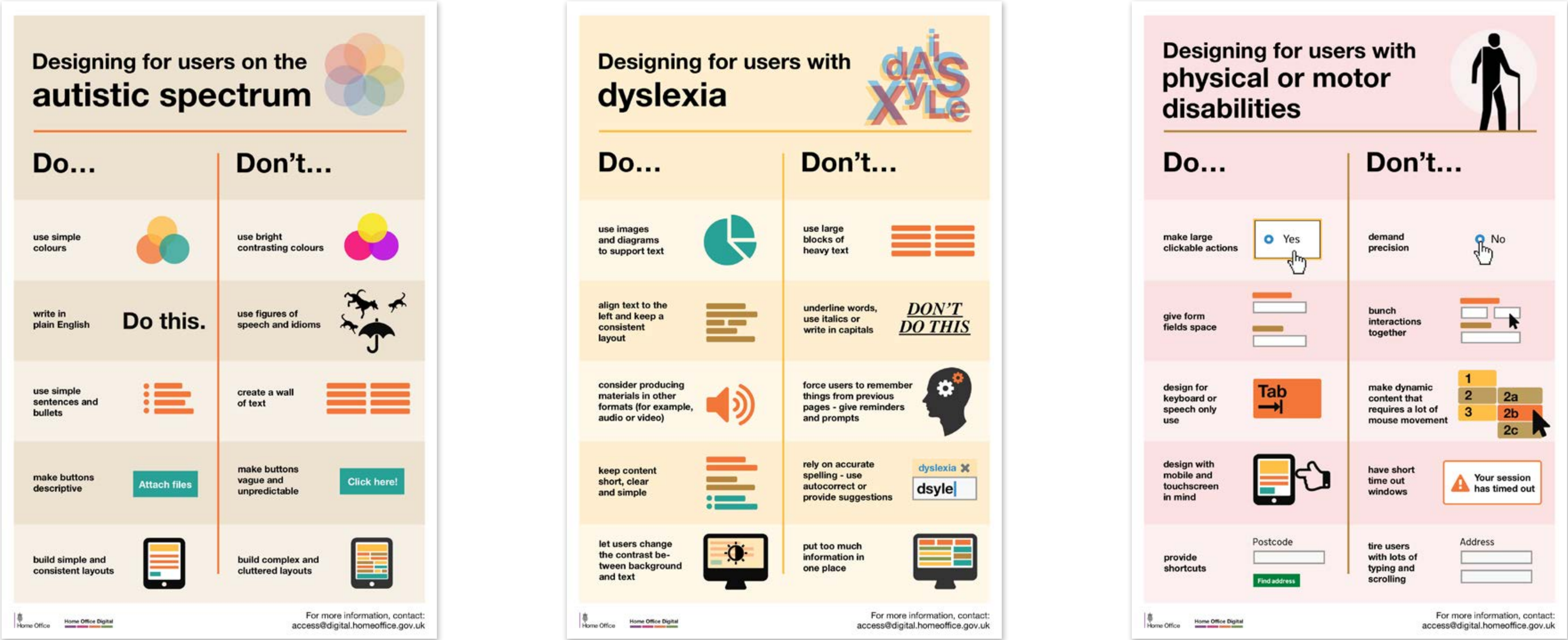


Fig 3: Posters from gov.uk, Sep 2016

The laws of UX

To formulate potential guidelines for ADHD, the primary objective is to investigate which of the characteristics of ADHD may affect product usability and accessibility. This will then be compared to pre-existing design solutions derived from psychology laws, which can be found in the book titled “Laws of UX”. Laws of UX was written by Jon Yablonski to make “complex laws of psychology accessible to designers” (Yablonski, 2020). He looks at how to use psychology to create a more empathetic and accessible user experience. Applying these psychology laws to ADHD symptoms or executive functions affected by ADHD, could provide potential design solutions or guidelines to creating ADHD accessible content.

“As humans, we have an underlying blueprint for how we perceive and process the world around us, and the study of psychology helps us decipher this blueprint. Designers can use this knowledge to build more intuitive, human centred products and experiences... We can use some key principles from psychology as a guide for designing in a way that is adapted to people” (Yablonski, 2020).

Distraction & attention

One challenging characteristic of both inattentive and combined type ADHD is being easily distracted. This can cause behaviours such as having trouble paying attention to tasks, missing details, and getting bored quickly (ADHD Aware, 2021). The psychology law “The von Restorff Effect” (also known as The Isolation Effect), is based on the concept that people are drawn to the most salient elements. “In order to maintain focus on information that is important or relevant to the task at hand, we often filter out information that isn’t relevant” (Yablonski, 2020). As research suggested that those with ADHD learn better when the information is salient, considering this in accessibility design guidelines could suggest improved information processing for the ADHD user.

To direct attention, Yablonski suggests using visual emphasis to guide the user to the most important information, whether this is an action they need to take or key information they need to absorb. This can be achieved through using colour, shape, size and position, to direct attention to the most important piece of information. News websites achieve this well, by using scale to direct the user to the featured headline. Colour and highlighting can also be used to direct the user to

something that needs actioning, such as notifications or alerts, or to information that needs retaining. However, colour cannot be relied on to give the only context, as colour blindness has to be considered in accessibility guidelines.

To avoid the user becoming distracted, another suggestion is to use a clear, minimalist, design, allowing adequate whitespace to provide breathing room. However, if the design is too minimalistic, it can become under stimulating and therefore loses the users attention, however stimulation will be discussed later in the report. Another suggestion is to avoid the use of pop ups, GIFs, animated ads and the use of auto-play. This will allow the user to remain focused, otherwise, the use of these can “kick the user out of their current workflow and distract them” (Wolf, 2023).

Apple

Apple's website is a good example of the von Restorff Effect. It utilizes a clean and minimalist design with large product images and prominent headers, directing users' attention to their latest products and services. The use of bold and large typography for headings and key messages helps users quickly identify the most important information on the page. This not only enhances readability but also helps users focus on essential content.

The website also incorporates interactive elements like product demos, 360-degree views, and videos. These interactive features can capture users' attention and keep them engaged with the content. Using illustration and animation to turn the products into characters makes the brand fun and engaging. The website also embraces whitespace which helps reduce visual clutter. This clean but visual design ensures that important elements remain salient without overwhelming users with too much information.

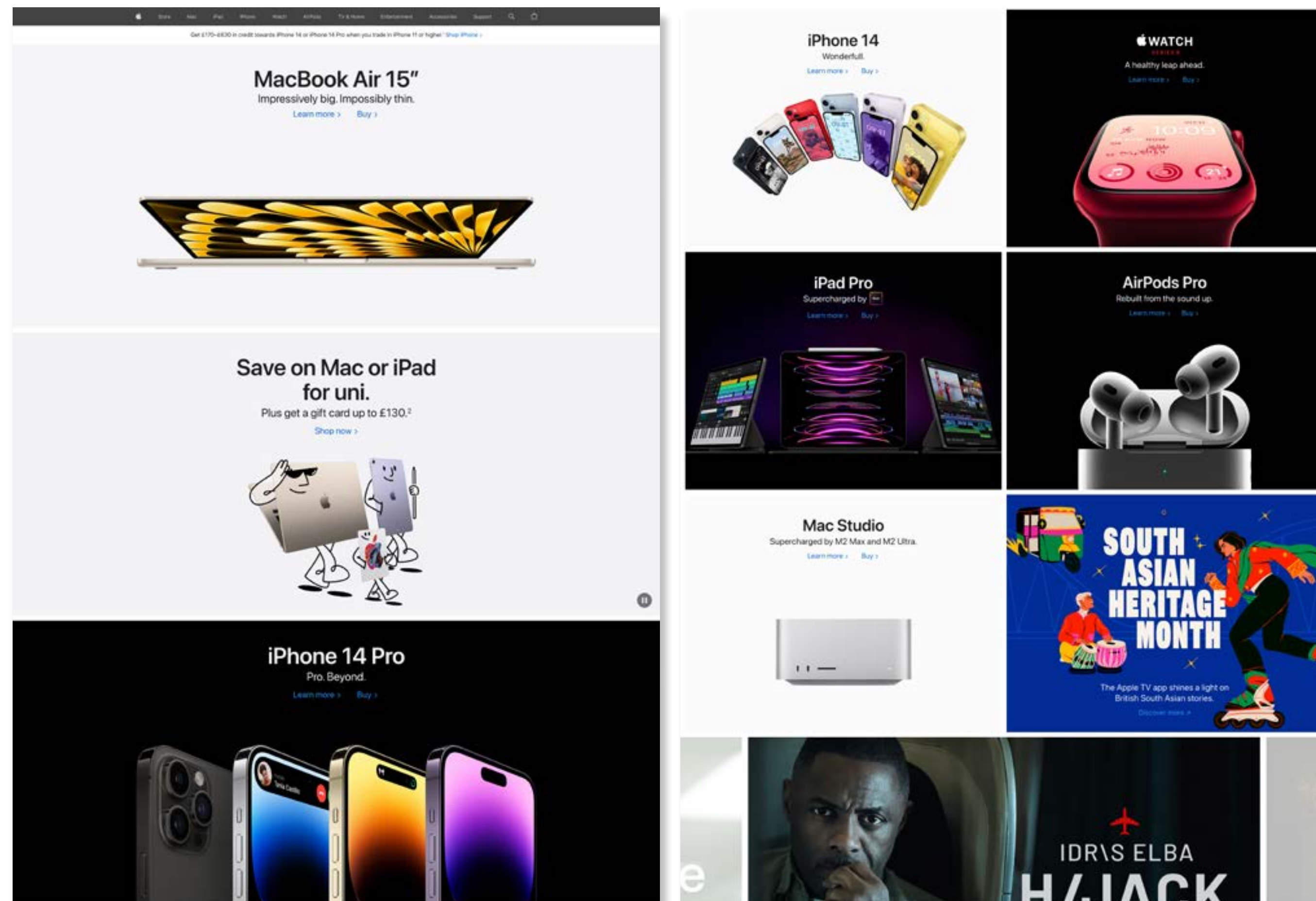


Fig 4: Apple website

Decision making

Decision making is a high-level cognitive process based on cognitive functions including working memory, perception, and attention. As ADHD is associated with impaired cognitive development (Coghill et al., 2018), decision making can cause the user to become overwhelmed. Hicks law looks at cognitive load and its relation to the time it takes to make a decision. Formulated in 1952 by psychologists William Edmund Hicks and Ray Hyman, they found that “people take longer to make a decision when given more options to choose from” (Yablonski, 2020). The more complex the interface is, the longer the decision time as the user must first process the information before deciding. Yablonski suggests simplifying information and minimising choices can help with cognitive load for the ADHD user. “When an interface is too busy, actions are unclear or difficult to identify, and critical information is hard to find, a higher cognitive load is placed on users” (Yablonski, 2020). For example, highlighting recommended options could be a visual way to reduce cognitive load.

Another example could be simplifying the terminology or language used. By writing content at no more than 9th grade reading level can help with cognitive load. There are readability accessibility checkers, such as readability.io, which check the numbers of words per sentence and number of sentences per paragraph (Collins, 2022). However, if for example the content is medically approved and unable to be simplified, a mechanism to help define complex words could be used. Therefore, when the user is reading complex information, there is a tool to provide definitions of trickier terminology.

In terms of design, if a website or interface is complex to navigate or key information is difficult to source, the higher the cognitive load, causing the ADHD user to become overwhelmed and lose attention. A common way to communicate critical information without the use of unnecessary complex terminology is through iconography. “They provide visual interest, they save space, and they can

provide quick recognition if they hold universal meaning” (Yablonski, 2020). Icons or graphics can convey information more quickly than text. This could provide a way for the ADHD user to quickly scan the information and find what they are looking for, without increasing decision time.

Another solution for decreasing decision time is to have clear actions, such as buttons or links that users can understand without having to rely on content around it. For example, having a button or link that says “click here” doesn’t give any context without having to read the information beforehand. Instead, using clear instructions such as “submit” or “apply here” gives the user context and decreases decision time.

Google

Google's search interface is a classic example of applying Hicks Law. When users visit the Google homepage, they are presented with a simple and uncluttered design with just a single search bar. By keeping the interface clean and focusing on a single action such as typing a search query, Google minimises the cognitive load, allowing the user to focus on the question they want to ask. It is only once the query has been submitted that it shows more information.

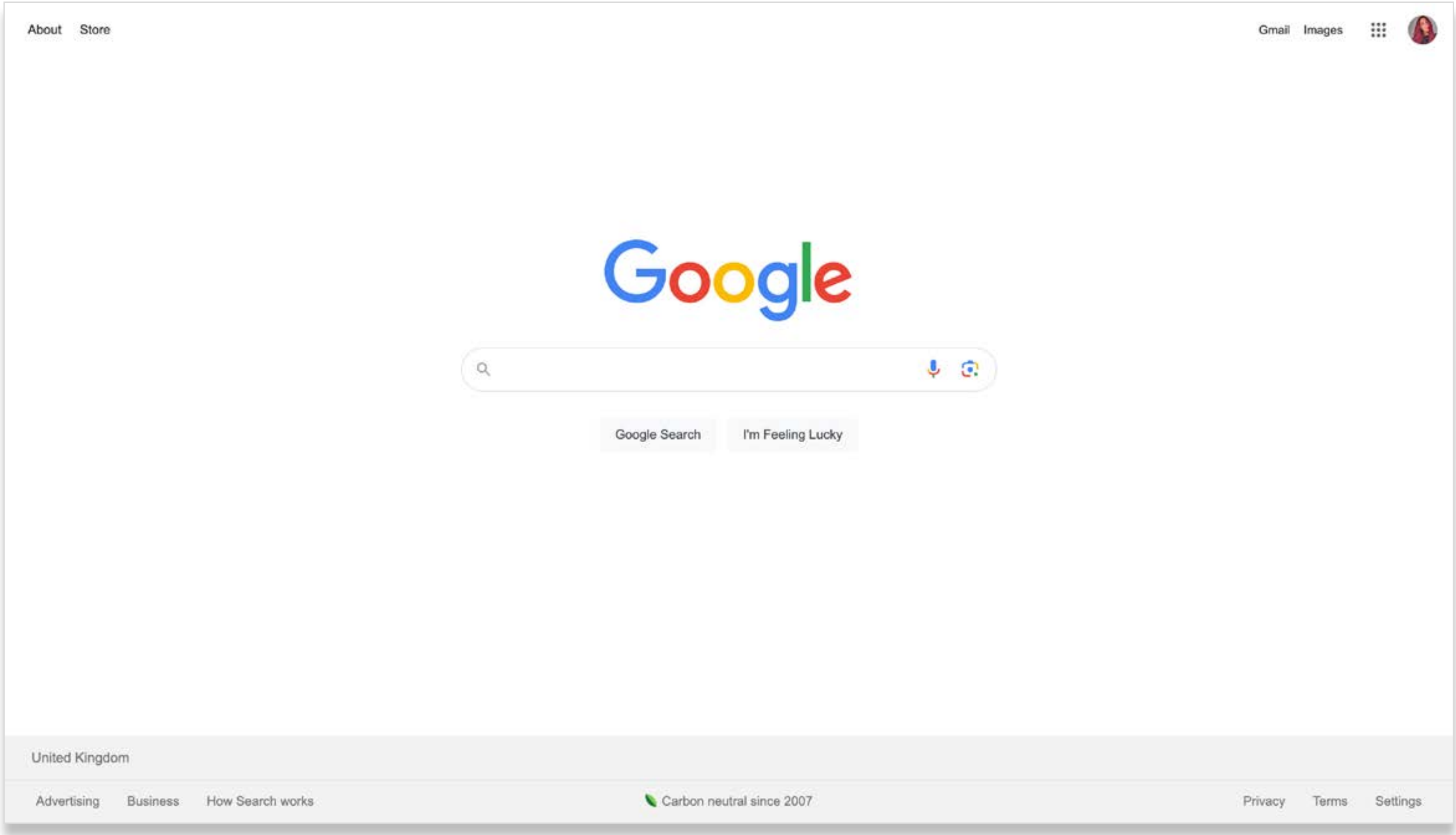


Fig 5: Google search enging

Working memory & focus

Similarly to decision making, working memory is also a cognitive function and therefore impaired by ADHD (Coghill et al., 2018). Working memory is the part of short-term memory that is responsible for a person's ability to remember and process information in that moment. Those with ADHD may also find it difficult to remember certain tasks that require multiple steps, or they may become overwhelmed when there is too much information to digest (Gendron, 2022).

Miller's law looks at the limits of short-term memory and memory span. Originating from psychologist, George Miller, who looked at the limits on our capacity for processing information and the concept of "chunking". "The term chunks in cognitive psychology refers to collections of basic familiar units that have been grouped together and sorted in a person's memory" (Yablonski, 2020). Miller found that it is easier to understand and process information when it is organised in smaller chunks, which prevents the user from becoming overwhelmed.

In terms of design, this can refer to the use of hierarchy, whitespace, and formatting. By providing clear, bold, headings and subheadings, the user can scan the information easily and source the information they want to digest and discard the information that isn't relevant. When viewing text heavy content that isn't structured, it can overwhelm the ADHD user and cause them to lose focus. "Research has found that people on average only read 20-28% of text on a web page, and the pressure on the brain to understand content increases for every 100 words you put on a page" (Firth, 2019).

The recently introduced extension and application called Bionic Reading is a "reading system that supports the reading flow" (Bionic Reading, 2023). The eye is guided through the text by artificial fixation points. The reader can scan the text quickly by focusing on the typographic highlights, absorb the text faster. This is a great solution to text heavy content that cannot be edited or simplified. Similarly, another way to allow users to scan content quickly could be to include a clear

headline, followed by a quick synopsis or summary about the "chunk" of content. This can make it easier to scan relevant information and can help with remembering the key pieces of information (Leeds Autism AIM, 2021).

Another solution to keeping the ADHD user's focus sustained, is to use multiple formats. If there is a lot of text to read, considering the use of video or animation in addition to the text for the user to choose which format is better for them. "Research shows that the human brain can process visuals faster than written text" (Deshpande, 2023). Videos with subtitles and downloadable transcripts are known to help people with other neurodivergent disabilities such as autism and dyspraxia (Portlock, 2023), and therefore can be applied for those with ADHD.

Skillshare

A good example that uses Miller's law effectively is Skillshare. Skillshare is an online educational platform with educational videos and lessons. The website uses chunking to present video lessons in short, digestible segments. Each lesson is broken down into separate sections, with clear subject areas, making it easier for learners to follow along and retain information. The website offers curated learning paths that guide users through a series of related courses on a specific topic. By grouping related courses together, users can easily follow a structured learning journey, fostering a sense of progression and accomplishment.

The use of headings, subheadings, and bullet points on course pages creates a visual hierarchy, making it simple for learners to scan and identify key information quickly. This organisation prevents cognitive overload and helps users locate the most relevant content easily.

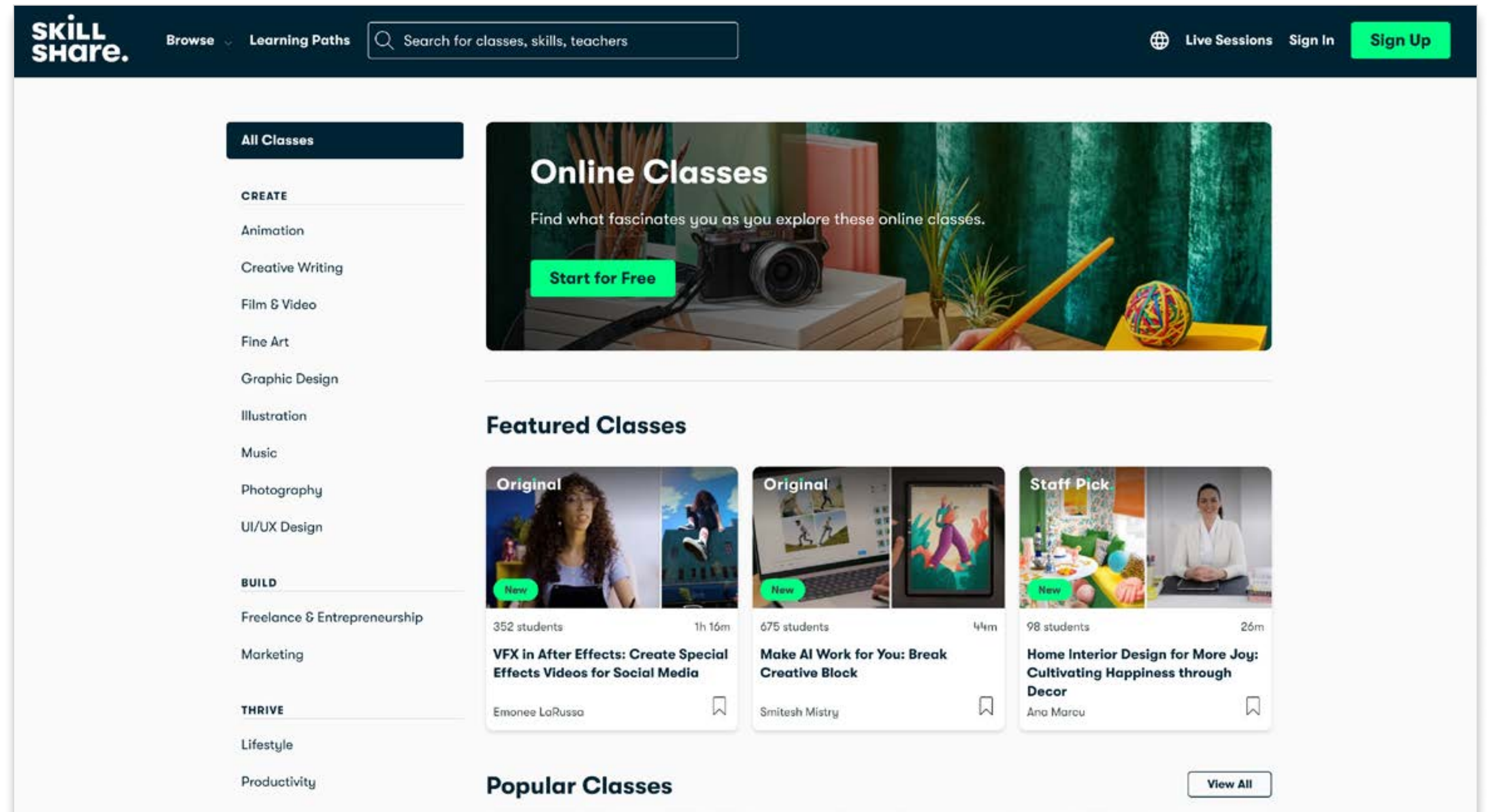


Fig 6: Skillshare website

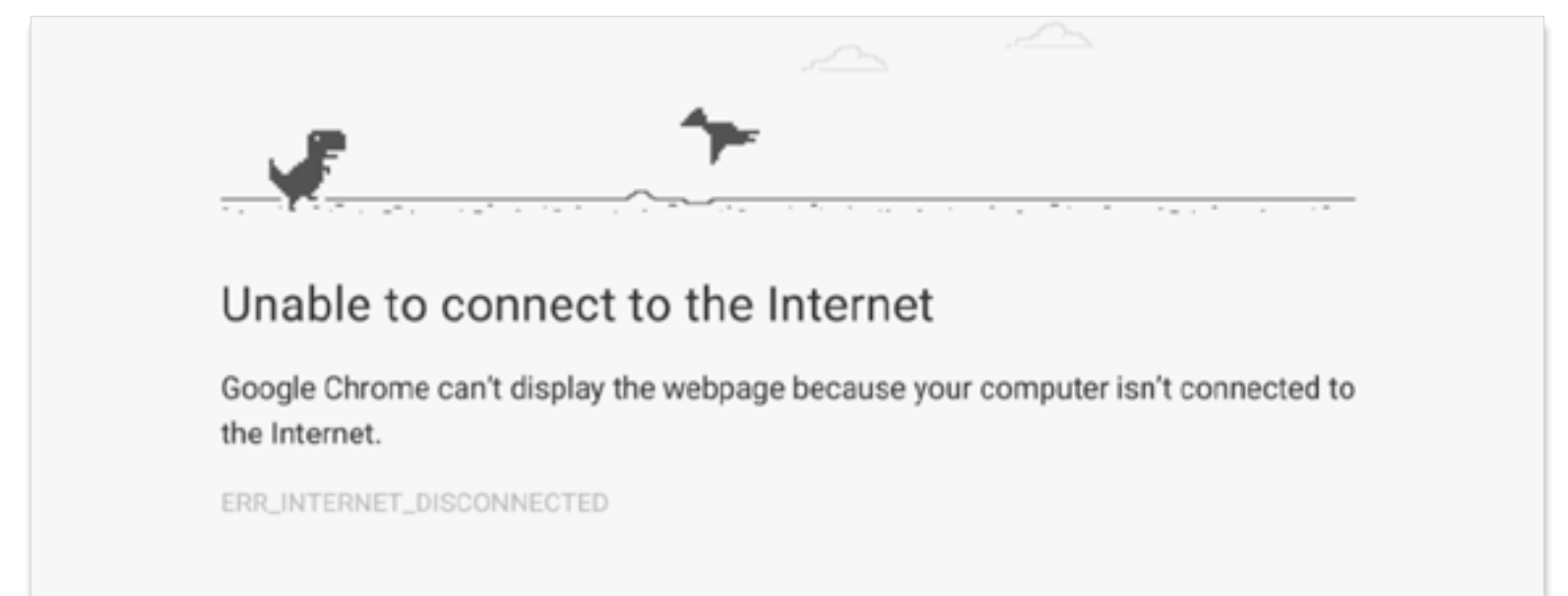
Stimulation

People with ADHD have a defective dopamine receptor D2 gene (DRD2). This makes it difficult for neurons to respond to the neurotransmitter, dopamine, which is responsible for feelings of pleasure and reward (Oscar Berman et al., 2008). This means that less dopamine is being produced, therefore people with ADHD may compulsively seek high-dopamine activities to stimulate their brains (BetterHelp, 2023).

The Peak-End Rule is a cognitive bias, which is a “systematic error of thinking or rationality in judgment that influence our perception of the world and our decision-making ability” (Yablonski, 2020). In other words, we tend to remember events during the peak emotional moment. By introducing positive experiences when the user has completed task can cause a peak of emotion. A good example of this is used by the email marketing platform, Mailchimp. Once an email campaign is sent, there is an animation of the company’s mascot giving the screen a high-five. This detail reinforces the feeling of accomplishment, giving the user immediate gratification and a positive experience.

Using interactive elements allows the user to engage with the interface, causing stimulation and therefore releasing dopamine. A good example of an interface that effectively uses interactivity is the website of design studio HAWRAF’s. HAWRAF were an interactive design studio in New York and their website had interactive elements where you could use your computer mouse to write notes and play games on their homepage. This made the content memorable, fun and engaging. Applying this to interfaces made for an ADHD user could make the content fun and stimulating but could also be quite practical when writing notes or highlighting sections as the user is reading it.

Another example of great use of interactivity is google offline t-rex game (fig 7). It is a simple game that appears when you are waiting for your internet to come back online. This not only keeps the user stimulated but also tackles impatience, refraining the user from leaving the page. This is also known as gamification, which works by stimulating your brain to release dopamine. It’s about making boring activities feel like a game to improve motivation and productivity.



(Top) Fig 7: Google easter egg game
(Bottom) Fig 8: Google easter egg game

Print application

Guidelines on accessibility for printed materials are difficult to come by, even though UX and accessibility covers all areas, UX can be often be associated with digital only. Whilst most of the previous design solutions can be applied to print formats, there are also different elements to consider when it comes to a physical product. Firstly, the way a book is interacted with is completely different to a digital interface. For example, print engages more senses. With different paper textures, thicknesses, and the scent of the paper makes for a much more visceral experience (Lee, 2021). Those with ADHD tend to have sensory issues and can be sensitive to certain textures, sounds and smells which can cause sensory overload (Mae, 2023). However, sensory books, also known as touch and feel books, are said to be engaging as they encourage interaction. This could be explored further to see whether sensory interactions on print materials could benefit the ADHD user. Another way printed material encourages interaction is the opportunity to highlight and write notes, which can lead to better memory and comprehension (Yue et al., 2014), whereas this isn't possible on a digital interface.

Another thing to consider is that users tend to spend longer time with a printed product, giving more time and patience to the experience. Whereas compared to a digital interface the user is after speed and quick access, making them more likely to skim digital content (Ross et al., 2017). As they tend to spend more time with the printed product, this can also help with distraction. Although it cannot completely dissolve any environmental distractions, it can provide a space free from digital interruptions such as pop ups, GIFs and ads. Research also suggested that people feel most concentrated when reading a printed book compared to reading on a screen (Jabr, 2013), which could be due to less digital distractions.

Studies have found that “print-based texts contributed more to increased comprehension and recall” than digital content (Ross et al., 2017). Although it has been argued that this is due to the simplicity of the layout and structure of printed documents as opposed to digital structure which is less taxing and allows more capacity for comprehension. This goes back to Hicks law and cognitive load. However, this also could be due to the effects of blue light, which places additional stress on the readers eyes.

Guidelines

By considering all of the previous UX laws and ADHD characteristics in this report, the list of proposed accessibiltiy guidelines for ADHD are as follows:

1. Direct attention using visual emphasis

Use colour, shape, size and position to highlight important information or action for easy identification and engagement.

2. Minimise distractions

Design interfaces with a clear, minimalist layout and avoid elements such as pop-ups, animated ads, and auto-play that can distract users with ADHD from their task.

3. Simplify decision making

Minimise cognitive load by reducing options and presenting information into smaller, digestible chunks. Use clear instructions, iconography, and graphics to convey information quickly and effectively.

4. Use clear and accessible language

Keep language at a 9th-grade reading level to make it easier for users to comprehend complex information. For technical content, provide mechanisms to define complex terminology.

5. Optimise information hierarchy

Use clear headings and subheadings to organise content and facilitate easy scanning of relevant information. Avoid overwhelming users with text-heavy pages.

6. Integrate interactivity

Include interactive elements to engage users and stimulate their attention. Gamification strategies can enhance motivation and productivity.

7. Positive peaks

Introduce positive experiences at key moments to boost dopamine and reward systems to create memorable interactions.

8. Consider multiple formats

Provide information in multiple formats, such as videos or animations with subtitles and downloadable transcripts, to cater to different learning preferences and sustain focus.

Conclusion

In conclusion, the rise in adult ADHD diagnoses has brought attention the lack of user-centred accessibility guidelines. As the number of individuals seeking information about ADHD continues to grow, it is key to consider the unique needs of this user demographic. User-centred design principles play a crucial role in understanding the needs and challenges faced by individuals with ADHD. By introducing these guidelines, designers or studios can create more accessible and engaging content for users with ADHD.

To accommodate distraction and retaining focus, designers should use visual emphasis through colour, shape, size, and position to direct attention to crucial information or actions. Clear, minimalist designs with sufficient whitespace can prevent distractions, but over-simplification should be avoided to keep the user stimulated. To retain focus, it is important to avoid elements like pop-ups, animated ads, and auto-play, which can disrupt the workflow and lead to the user losing focus.

To reduce cognitive load and decision making, designers can minimise choices and use visual emphasis, such as highlighting important content, to reduce cognitive load. The use of icons and graphics can convey information more quickly and is more visually stimulating. To assist with impaired working memory, organising information into smaller, digestible chunks, can prevent the user being overwhelmed by excessive text. Using hierarchy, whitespace, and formatting with clear headings and subheadings can make information easy to scan which can help with processing information. Offering text summaries or synopses can also help users find key information so the user doesn't have to read through unnecessary text. Additionally, using multiple formats like video or animation with subtitles or transcripts can sustain focus and assist with distraction.

Furthermore, incorporating positive experiences can evoke a sense of accomplishment and provide immediate gratification for the user, which can help with engagement and can make the content more memorable and fun. Including interactive elements can further stimulate users and reduces boredom.

Therefore, by implementing the proposed guidelines, which are yet to be tested, designers can create more inclusive and accessible resources for individuals with ADHD. Using empathy to understand the unique challenges faced by ADHD users could lead to better engagement with the content, increased the awareness of the disorder, and ultimately help adults who have been recently diagnosed, or considering going for a diagnosis.

Images

Figure 1: ADHD UK website about page. ADHD UK , July 2023, <https://adhduk.co.uk/about-adhd/>

Figure 2: Double page spread from book 'Women with Adult ADHD'. Photographed by the Author.

Figure 3: Accessibility Do's and Dont's. GOV.UK, Sep 2016, <https://accessibility.blog.gov.uk/2016/09/02/dos-and-donts-on-designing-for-accessibility/>

Figure 5: Google search engine. Google, July 2023, <https://www.google.com/>

Figure 6: Skillshare website. Skillshare, July 2023, <https://www.skillshare.com/en/browse?via=header>

Figure 7: HAWRAF Website. HAWRAF, June 2015, <https://www.oneclub.org/portfolio/view/-7018/the-hawraf-website>

Figure 8: Google easter egg game. Google, June 2015, <https://9to5google.com/2015/06/18/chromes-easter-egg-t-rex-game-just-got-harder-introduction-pterodactyls/>

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