# Re-Designing the Interaction of Day-to-Day Applications to Support Sustained Attention Level[1]

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**Abstract.** Digital distractions in decreasing people's attentional abilities have become a subject of increasing concern and scrutiny in recent years. Based on the existing literature regarding the negative impact of technology on attention, this paper examines various solutions, encompassing mostly reactive strategies. It also questions the prevailing design practices prioritising learnability and efficiency and proposes a shift towards designing interactions that minimise distractions and promote sustained attention while emphasising the negative consequences of distraction-prone interactions on users' attentional resources. As a proactive solution, we present a novel interaction strategy called "Attention mode," which selectively reduces distractions when using apps. We developed three prototypes that consistently incorporate this strategy, each used in a different application on a different device: a news website on a desktop, an e-book reading app on a tablet, and a video-watching app on a smartphone. We conducted usability testing with 13 participants to evaluate this design feature and address the implications of these in the interaction design knowledge and practice today. By advocating for considering users' attentional abilities in design, this work contributes to the field of Human-Computer Interaction (HCI) and calls for a balance between cognitive well-being and traditional usability criteria.

**Keywords:** Sustained Attention, Cognition, User Interface Design, Usability, Digital Technology, Smart Devices, Distraction, Task Switching, Notifications

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[1] This work was conducted with the financial support of the SFI Centre for Research Training in Digitally-Enhanced Reality (d-real) under Grant No. 18/CRT/6224 and the SFI Centre Grant No. 12/RC/2289_P2 at Insight the SFI Research Centre for Data Analytics at Dublin City University. 

## 1 Introduction

In recent years, there has been considerable interest and concern surrounding the influence of digital technology on human cognition. Numerous studies have documented detrimental effects on various cognitive abilities, including memory, decision-making, and problem-solving skills. Among these, attention has emerged as the most extensively studied area concerning the adverse impact of smart devices and digital applications. People's deteriorated attentional abilities are no longer only in the form of personal anecdotes shared in friendly conversations, as increasing scientific evidence in academic studies and experimental results have appeared for the past 15 years or so [1] [2]. Trends that contribute to speeding up the worrying phenomenon of reduced attention span include shorter durations of media content on TV and the content presented on popular social media apps such as TikTok, YouTube Shorts and Instagram.

In particular, the interactions provided in today's computing systems that facilitate the consumption of media contents and those supporting other daily tasks seem to have been specifically designed to aggravate the situation: web user interfaces are filled with elements diverting the user's attention away from the main task of the page (a myriad of navigational elements such as menu bars, short-cut buttons and other non-content-related information, notwithstanding the commercial advertisements embedded as part of business model); "related" items frequently shown on informational and e-commerce systems almost as *de facto* standard; operating systems supporting easy switching amongst multiple applications; constant email/message notifications, to name but a few. Cognitive scientists have already established that frequent multitasking reduces the user's cognitive resources while at a task, consequently making the person more susceptible to distractions [3] [1].

Commonly-used interactions provided in day-to-day websites and applications on their smartphones, tablets and desktop/laptop computers today have been designed to support a broad umbrella concept of "usability" where typically a few criteria such as learnability (designing it to be easy to learn how to use for the first-time users) and efficiency (designing it to require less user effort or time) are prioritised as the main aim of the design and all subsequent success measures based on achieving these criteria. Alongside these criteria, there is an abundant quantity of design knowledge and guidelines in the form of influential academic textbooks [4] [5], as well as heuristics, checklists, and design tips available today, accumulated and refined over the past few decades as the results of on-going theoretical discourses, experiments, and trial-and-error iterations on the market.

If the distraction-prone interactions we use today result from learnability- and efficiency-focused design practice, can we re-design these interactions that consider the negative consequences on the users' attentional abilities now that we are aware of the problem? Available literature in this area is mostly about confirming the negative impacts on our attention (e.g. [6] [7] [8]), and existing solution ideas are almost exclusively either more disciplines on the side of the user, such as pre-commitment [2] and self-regulation [1, Chapter 13] or reactive strategies such as automatic blocking of app usage or batching of notifications. Few proactive design proposals are available where considering such impacts on cognition is an integral part of interaction design, other than tentative design ideas that gamify conventional apps to reduce the potentially harmful effects of over-relying on daily technologies [9].

In this context, we propose a design solution that aims to minimise such negative impacts on attention by helping easily control major factors that will make the user more prone to distractions directly available on the user interface of the application currently used. This approach can help users turn off potential distractions from the tasks more readily, thus remaining focused on them, and reduce cognitive load to improve sustained attention, ultimately expected to improve their overall experience. We share the insights gained through the design process, usability testing sessions with 13 participants using three prototype mock-ups that implement this idea, and the analysis of feedback and reflection on in what ways the usability/design knowledge, such as well-established usability criteria and design principles might be augmented or extended to help the designers take this issue into account when designing.

## 2 Disruptive Behaviours Related to Digital Technology Usage

### 2.1 Effects of Digital Technology Use on Attention

Table 1 summarizes a body of evidence from the literature regarding the detrimental effects of digital technology on our attentional processes, despite some reported benefits in some cases. Various behaviours related to technology usage can disrupt our attentional systems and executive control in the short and long term. For instance, adolescents who frequently engage with technology are at a higher risk of developing symptoms associated with ADHD due to multitasking and repetitive shifts in attention [6]. Ophir et al. [7] found that individuals who engage in extensive media multitasking exhibit decreased voluntary attention allocation performance when faced with distractions.

Extended internet and social media use can potentially deteriorate the executive attention network, which is responsible for executive functions such as inhibitory control and willpower [10][11]. The continuous bombardment of notifications intervenes with inhibitory control and aggravates the situation further. Habitual social media use makes it harder for people to control their social media use even when they have other primary tasks [12][13][14]. However, digital technologies do not only adversely affect attentional systems: regularly playing video games enhances and improves visual, divided, and sustained attention in some cases [14][15].

### 2.2 Exploring Existing Solutions and Their Limitations

The scientific literature available today predominantly mentions digital media's negative (and occasionally positive) effects on cognition as their conclusions of the study. Only a few of the authors move on to suggest any possible solutions to these effects. Those who do advise solutions require serious commitment and dedication from the end-user side, as observed in the last two columns in Table 1, as cognitive training/CBT and behavioural intervention (such as pre-commitment and self-constraints in digital technology usage that require a great deal of discipline and efforts).

**Table 1.** Key papers referring attention and executive control effects of digital technology and solution type proposed or hinted if any [32].

| Study | | Proposed (or Hinted) Solutions | |
|---|---|---|---|
| | Effect on Attention | Cognitive Training or CBT[2] | Behavioural Intervention |
| Barasch et al., 2017 [16] | ↑[3] | | |
| Cardoso-Leite et al., 2021 [17] | ↓ | | |
| Davis, 2001 [10] | ↓ | ✓ | |
| Du et al., 2019 [12] | ↓ | | |
| Freytag et al., 2020 [13] | ↓ | | |
| Green and Bavelier, 2003 [15] | ↑ | ✓ | |
| Madore and Wagner, 2019 [3] | ↓ | | |
| Madore et al., 2020 [18] | ↓ | | |
| Misra and Stokols, 2012 [14] | ↓ | | ✓ |
| Ophir et al., 2019 [7] | ↓ | | |
| Rosen et al., 2012 [8] | ↓ | | ✓ |
| Rosser et al., 2007 [19] | ↑ | ✓ | |
| Schacter, 2022 [20] | ↓ ↑ | | |
| Small et al., 2020 [6] | ↓ ↑ | ✓ | |
| Uncapher & Wagner, 2018 [21] | ↓ | | |
| Throuvala et al., 2020 [22] | ↓ | ✓ | ✓ |

**Pre-commitment to Limit Digital Technology Use.** Findings from the literature suggest that time away from screen-based media improves attention [22]. One study mentions that Intel Corporation implemented "quiet time", where employees took time off from electronic communication during designated periods to minimise distractions to mitigate this problem [14].

Popular culture has also become aware of smartphones' cognitive costs [23]. News articles and books mention individuals replacing their smartphones with basic mobile phones with limited functionality to increase productivity and eliminate distractions

[2] Cognitive Behavioural Therapy.
[3] "↑" icon refers to improvement in attention and executive control whereas "↓" refers to deterioration.

[24, 2]. There are also software programs that block the internet for designated periods and web browser extensions that remove irrelevant contents such as notifications, newsfeeds, and advertisements [25][26][27].

**Cognitive Training.** Some studies found that specific behavioural interventions such as internet searching might reduce cognitive decline in older adults [19]. This practice could be termed cognitive training since users must complete search tasks in different sittings over a period. For example, Cogmed offers five weeks of digital cognitive training programmes to improve their clients' attention and working memory [28].

Cognitive-behavioural therapy investigates cognitive distortions and replaces problematic internet use with healthy behaviours [17], using various methods such as recording internet use, keeping individuals away from the Internet for a period and having them observe the change in their cognitive skills.

Most of the suggested solutions summarised above see the technologies and people's interactivity with them as given and try to reduce the negative consequences during or after using technology instead of re-thinking how the technology could be designed differently in the first place to result in fewer such consequences. Considering the attention issue from the start when developing the technology will be a more holistic solution, though very little is known about applying design knowledge to support this.

## 3 Design Approach for Sustained Attention

### 3.1 Design Strategy and Approach

We developed the "Attention Mode" concept that effectively tackles distractions in diverse contexts. Triggered by clicking, dragging, tapping, or swiping depending on the platform's supported modality, the mode supports the reduction/removal of potential media distractions. This feature bears a resemblance to the "Focus" [29] and "Downtime" [30] functionalities found on smart devices, which aim to reduce distractions. However, unlike these existing features that require multiple steps scattered across various locations and only address specific distractions, the Attention Mode collectively eliminates designated media distractions with a single action. In this sense, the mode is perhaps more analogous to "airplane mode" of a typical smartphone which, when turned on, will collectively turn off all functions related to mobile/wi-fi usage scattered around in different parts of the settings and options. Furthermore, we intend to seamlessly integrate this mode into the user interface of applications, allowing users to trigger it more effortlessly while engaging in tasks.

### 3.2 Attention Mode Button

**Interaction Strategy.** The Attention Mode button simplifies user interaction by presenting a button strategically placed within the user interface. Upon interaction, this button instantly reveals a set of sub-options that can be selected (see Fig. 1a). When the button is pressed, users can choose between one or two different modes, depending on the application, platform, and device. These modes exclude various distractions (refer to Fig. 1b and 1c). Furthermore, in some instances, the interface provides customisation options in the settings menu, as depicted in Fig. 2a. In this settings menu, users can change pre-set default values for Attention Mode Level 1 (Fig. 2b). Customisation options allow users to personalise the mode to their liking (i.e., what distractions should constitute as Level 1 and 2 thus be blocked when it is activated). In contrast, the pre-set default values provide users with a convenient starting point for users who may not want to customise the mode.

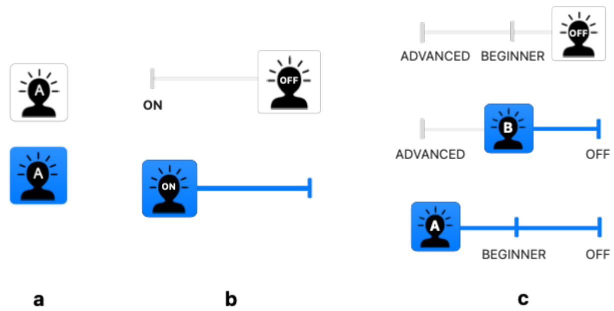



**Fig. 1.** Attention Mode can be turned off and levels can be selected by using Attention Button. **a** Attention Button. **b, c** Attention Mode level options (appears when pressed).

Once a level is selected, the mode is activated instantly and can be turned off without requiring confirmation. A concise explanation of the Attention Mode is provided within the Options window for first-time users. If users do not want to see it, they can press the “up” arrow for the window to collapse and hide the explanation and settings. They can display them again by pressing the “down” button. The Options disappear when the close icon or an area outside the window is clicked or tapped. Once it disappears, users can still see the status of Attention Mode on the UI as a single button.

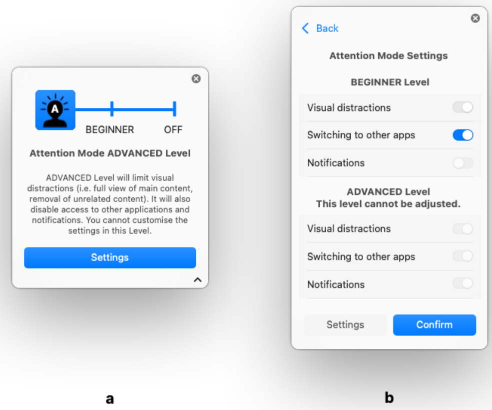



**Fig. 2.** Attention Mode options can be customised in settings menu when relevant for a specific application or platform. Levels can be selected by using Attention Button. (a) Settings button (b) Setting options where all attention-related features are grouped into Level 1 and 2.

While turning on/off with different option sets is not novel, we are gathering a few design choices to enable an interaction that is particularly suitable for our purpose. In summary:

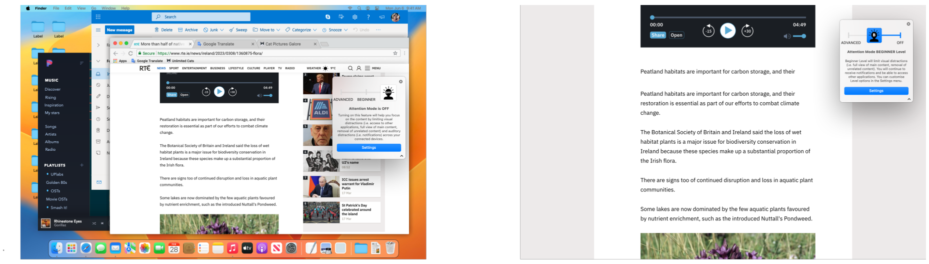
- It collects options otherwise scattered around into one location for access, thus a single button press to activate/deactivate.
- Information about distractions and usage is given to help users raise awareness of digital distractions.
- The user can select one of the levels of attention, each representing a higher-level set of options as needed.
- The widget-level interaction mechanism can be designed slightly differently to suit different applications on different platforms.

We developed three different user interfaces each for three interaction devices: a news website on a desktop, an e-book reader app on a tablet, and a video-streaming app on a smartphone. This diverse set of media was to test how the overarching concept of the Attention Mode strategy could be consistently applied to the three commonly used interaction platforms and what aspects each might require some design customisation due to the unique affordances of each medium.

**Prototype 1: News Website on Desktop.** This prototype is designed to demonstrate a desktop environment with minimum distractions when the user's primary task is to read an online newspaper article. Distractions such as recommended articles, website advertisements, browser settings, desktop view, and other open applications on the computer are considered irrelevant to the article itself. To eliminate these distractions and allow users to focus solely on reading the article, Attention Mode can be activated (refer to Fig. 3).

Here, the Attention Button should be present in the top-right corner of every page. The purpose of the button is to provide a consistent function across all pages, while the specific function may vary slightly depending on the page.

In this example, customization is available for Attention Mode at the Beginner Level, while the Advanced Level cannot be personalized. The Advanced Level entails the elimination of all distractions, including irrelevant visual content, email, and messaging notifications, and switching to other applications to prevent media multitasking. It is crucial to note that activating the Attention Button on any page will have a global effect on all other site pages ensuring the user's preferences and selected settings are consistently saved and applied throughout the site. Users can allocate their attention more effectively by eliminating visual distractions that may prompt task switching and blocking external notifications during tasks [7]. Helping users focus on their primary task, in turn, reduces the occurrence of attention lapses [18] as the opportunities for multitasking behaviour decrease.



a b

**Fig. 3.** (a) Attention Mode options are displayed when Attention Button is clicked on with general information. (b) Attention Mode maximised the main content and removes irrelevant visual distraction when set to level 1.

**Prototype 2: E-book Application on Tablet.** Designing an interface for e-book reading on a tablet requires different considerations than designing for news sites or other browsing activities on a desktop. While both activities involve reading, the reading experience for an e-book is typically longer and requires more sustained focus.

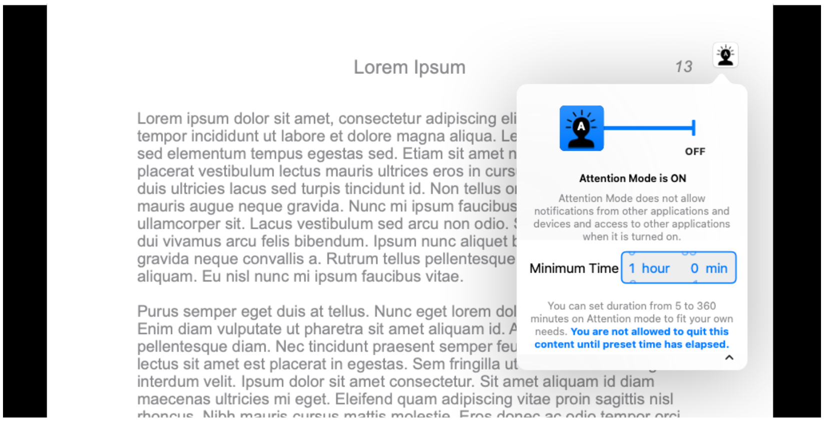
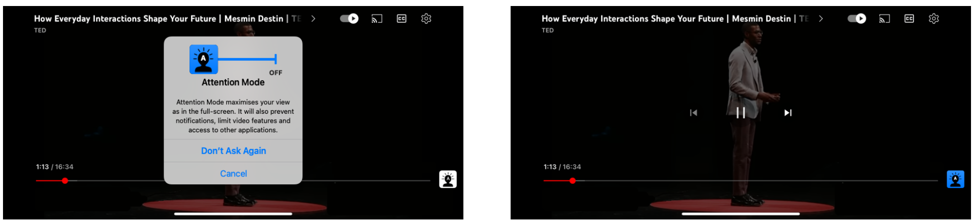



**Fig. 4.** Attention Mode options on eBook application on a Tablet.

Since consistent media multitasking reduces sustained attention ability in the long term [3, 18], it is essential to design an interface that encourages users to stay focused for extended periods by preventing them from switching to other applications [1]. Therefore, the user can set a target duration on Attention Mode to stay in the reading task (Fig. 4), where the user cannot switch to other applications until the specified time is up. Since the app has no visual distraction (tablet apps typically occupy the whole screen visually), only ON-level multitasking and notifications are prevented, unlike the desktop example above.

**Prototype 3: Video Streaming Application on Smartphone**. Implementing Attention Mode in this video-watching app was to augment a full-screen button typically featured on many video players by blocking notifications and other distractions, easily selectable in one go. Located at the bottom-right corner of the video player panel, the user can turn the mode on to maximise the video as in the classic full-screen feature. Additionally, notifications are silenced, switching to other applications is prevented, and buttons like the share, comment and "more videos" buttons are removed, as these options might encourage multitasking at the ON level, thus increasing the user's susceptibility to further distraction (Fig. 5).




a b

**Fig. 5.** In Attention Mode ON level, video occupies the whole screen, notifications are turned off, switching to other applications are not allowed, and several video features are removed.

The three designs were implemented in Sketch prototyping tool, to be used for the usability testing reported in the next section.

## 4 Usability Testing and Evaluation

### 4.1 Participants

Thirteen participants (n = 13) from diverse cultural backgrounds (2 French, 2 Indian, 1 Italian, 1 Brazilian, 1 Spanish, 1 Moroccan, 1 Colombian, 1 Chinese, 1 Kazakh, 1 Russian) took part in the study . The sample consisted of seven females and six males, ages 25 to 35 (mean age = 28.5 years). The participants were recruited through events organised by third-level institutions in Ireland. All participants provided informed consent prior to participating in the study. The study protocol was approved by the Ethics Review Commission of the Dublin City University.

It is important to acknowledge that the sample size is relatively small, which may limit the generalizability of the results. Nonetheless, efforts were made to include participants from various nationalities and genders within the available pool of participants.

### 4.2 Study Design

**Prototype Development and Feedback Iterations.** The development of the prototypes involved a series of iterations in the Sketch prototyping tool. Initially, three different prototypes were created, and these prototypes were refined through four iterative cycles. After each iteration, improvements and modifications were made based on the feedback. Following the third iteration, a preliminary feedback session was conducted with five experts from the technology and design fields. These experts provided valuable insights and suggestions for further refinement of the prototypes, reported elsewhere [32].

**Usability Testing Sessions.** Prior to the study, participants were provided with plain language statements and informed consent forms, which they were required to read and understand. After reviewing the materials, participants signed the consent form, indicating their willingness to participate in the study.

The usability testing sessions were conducted individually, each lasting approximately 15 minutes. Before the testing began, the context of the study was briefly explained to the participants verbally. Participants were then instructed to interact with each of the three prototypes. Using the Sketch environment, the news website app was accessed on a MacBook Air M2 2022, the e-book app on a 5th Generation 12.9-inch iPad Pro, and the video streaming app on an iPhone 11.

After using each prototype, participants were asked to complete the printed System Usability Scale (SUS), a validated questionnaire designed to assess the usability of a system. Additionally, participants were encouraged to provide their thoughts and feedback on their experiences with each prototype. They were provided with space to write down their comments and suggestions on the SUS form.

**Data Analysis.** The collected data, including the SUS scores and participant feedback, were analysed to assess the usability of the prototypes and identify areas for further improvement. The SUS scores were aggregated and analysed using descriptive statistics. The qualitative feedback provided by participants was examined to identify recurring themes and patterns.

Participant privacy and confidentiality were ensured throughout the study. Data were anonymized and stored securely, and personal identifiers were removed during analysis and reporting.

### 4.3 Results and Evaluation

Table 2 shows the mean and standard deviation values of the SUS scores for each prototype, providing an overview of the usability assessment. The SUS scores for all prototypes exceeded 80, falling within the "excellent" range [31]. This indicates that participants found the prototypes to be highly usable.

Among the three prototypes, the Attention mode feature on the video streaming app on the smartphone (Prototype 3) received the highest SUS score of 86.34, indicating a high level of usability. On the other hand, the same feature on the e-book app (Prototype 2) obtained the lowest score of 80.97, suggesting slightly lower usability compared to the other prototypes. The participants' preference was more varied for Prototype 2 compared to the other prototypes. This finding suggests that participants had mixed opinions and preferences regarding the usability of the e-book app.

Interestingly, despite Prototype 3 having the highest SUS score, participants were more inclined to use this feature when integrated into a news website on a desktop environment (Prototype 1), evidenced by the higher scores for Question 1 (S1), as seen in Table 3. These results suggest that while Prototype 3 performed well in terms of overall usability, Prototype 1 seemed to have an advantage regarding initial user preference. Further analysis and qualitative feedback could help provide deeper insights into the specific features or aspects that influenced participants' preferences and perceptions of usability.

Overall, the SUS scores indicate that all three prototypes were well-received and demonstrated high usability. The variations in scores and participant preferences provide insights for refining and optimising the prototypes in future iterations.

**Table 2.** Overall SUS score chart for each prototype.

| | Prototype 1 | Prototype 2 | Prototype 3 |
|---|---|---|---|
| **Mean Value** | 83.65385 | 80.96154 | 86.34615 |
| **Standard Deviation** | 13.60206 | 24.14234 | 14.3111 |

Together with SUS scores, the participants' comments provide valuable insights into the strengths and weaknesses of each prototype, as well as recommendations for potential improvements.

**Table 3.** Number of participants based on the score they reported for each question after using prototypes.

| | **Prototype 1** News website | | | | | **Prototype 2** E-book app | | | | | **Prototype 3** Video streaming app | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *1* | *2* | *3* | *4* | *5* | *1* | *2* | *3* | *4* | *5* | *1* | *2* | *3* | *4* | *5* |
| | *1: Strongly Disagree* | | | | | | | | | | | | | | *5: Strongly Agree* |
| S1 | 0 | - | 1 | 5 | 7 | 1 | 2 | 2 | 5 | 3 | - | 2 | 3 | 3 | 5 |
| S2 | 7 | 5 | 1 | - | - | 11 | - | 1 | 1 | - | 8 | 2 | 3 | - | - |
| S3 | - | - | 2 | 7 | 4 | 1 | 1 | 1 | 1 | 9 | - | - | 2 | 4 | 7 |
| S4 | 6 | 3 | 3 | - | 1 | 9 | 2 | 1 | - | 1 | 8 | 2 | 3 | - | - |
| S5 | - | - | 3 | 5 | 5 | - | 2 | 1 | 4 | 6 | - | 1 | - | 6 | 6 |
| S6 | 11 | 1 | 1 | - | - | 9 | 2 | 2 | - | - | 12 | - | 1 | - | - |
| S7 | - | 1 | 2 | 5 | 5 | 1 | - | 1 | 4 | 7 | - | - | 1 | 6 | 6 |
| S8 | 10 | 3 | - | - | - | 9 | 3 | - | 1 | - | 10 | 1 | 1 | 1 | - |
| S9 | - | - | 3 | 4 | 6 | 1 | 2 | - | 4 | 6 | - | - | 1 | 5 | 7 |
| S10 | 9 | 2 | 1 | - | 1 | 8 | 3 | 1 | - | 1 | 11 | 1 | - | - | - |

**Statements:**
*S1. I think that I would like to use this feature frequently.*
*S2. I found this feature unnecessarily complex.*
*S3. I thought this feature was easy to use.*
*S4. I think that I would need assistance to be able to use this feature.*
*S5. I found the various functions in this feature were well integrated.*
*S6. I thought there was too much inconsistency in this feature.*
*S7. I would imagine that most people would learn to use this feature very quickly*
*S8. I found this feature very cumbersome/awkward to use.*
*S9. I felt very confident using this feature.*
*S10. I needed to learn a lot of things before I could get going with this feature.*

Prototype 1 received positive feedback from participants, who recognised the value of the concept and expressed willingness to recommend it to others. However, participants also highlighted the need for a tutorial to aid new users in navigating the prototype. The recommendation to include a tutorial aligns with the suggestion for customisation options, emphasising the importance of providing a user-friendly and personalised experience. The feedback for Prototype 1 also emphasised its suitability for individuals with attention problems or those who engage in extensive web reading. The participants appreciated the UI's simplicity and ease of use when the Attention Mode is on, while providing suggestions for minor improvements such as reducing the size of the icon. There were differing opinions on the customisation of mode levels. One participant expressed interest in the idea of customising the level of distraction settings, while another participant raised concerns about potential confusion for less technologically inclined users. This feedback highlights the importance of considering the balance between customization and simplicity in the design of the Attention Mode.

Prototype 2 received mixed feedback, with some participants finding it helpful for avoiding distractions while reading and recommending it to others. Participants also mentioned the desire for a time display as an additional feature. Those unfamiliar with tablet-based interactions found the UI unintuitive and had difficulty using the prototype independently. Several participants reported they would have liked the flexibility to quit the mode whenever they wanted, even if they had set a target duration. The user having control over the usage (including multitasking) is one of the important design guidelines available today. However, prioritising attention by reducing the cognitive cost of task switching means that this guideline may need to be compromised, raising an issue on how the existing usability criteria could accommodate this.

The integration of the Attention Mode button within the video-streaming application was well-received by participants. However, there were differing opinions regarding the exclusion of certain features, such as the comment section. Participants highlighted the need to balance distraction reduction and retaining desired functionalities. Suggestions were made for including an ad-blocking option that appears when a video is streaming and improvements to the settings' accessibility. One participant liked the minimalist approach with fewer video options which also prevents accidental touches on the screen and unintended interruptions. This feedback suggests that users value simplicity and ease of use in the design of Attention Mode.

Overall, the feedback from the participants indicated that the proposed design approach of Attention Mode was well-received, with participants expressing positive sentiments about the concept of reducing distractions and creating awareness about their digital technology use. Suggestions for additional features, customisation options, and improved accessibility were highlighted.

Building upon the discussion on user feedback and the implications of design choices, it is evident that interactive applications' usability and user experience play a crucial role in shaping attentional processes. However, it is essential to recognise that an overemphasis on efficiency, effectiveness, and learnability in interaction can negatively affect specific attentional processes in the short and long term. Efficiency-oriented applications prioritise saving time and mental effort, which can lead to reduced cognitive engagement. Users may rely less on attentional systems and executive networks when interacting with such applications. Similarly, when learnability is prioritised, users require minimal attention during initial interactions, potentially leading to decreased attention involvement. These patterns of reduced cognitive effort can contribute to degradation in attention skills over time, like how muscles can weaken without regular exercise. Therefore, it is worth noting that prioritising cognitive well-being, including the attention process, may sometimes conflict with efficiency and learnability criteria, highlighting the need for careful consideration and balancing of design goals.

There are limitations of this study, including the small sample size and potential biases in participant selection. Conducting larger-scale user testing with diverse participants would further validate the findings and provide more comprehensive insights. Additionally, conducting follow-up studies to assess long-term usability and user satisfaction with the prototypes would be beneficial for evaluating their effectiveness and practicality in real-world scenarios.

## 5 Conclusion

As our time spent on everyday digital applications continues to increase, evidence of negative consequences such as distractions and reduced attention span is also growing. While approaches like blocking, pre-commitment, and creating awareness about digital technology use have been suggested to mitigate these issues, a more proactive stance would be to redesign those applications in such a way as to reduce such effects. This study demonstrates a design approach that prioritises our attentional well-being by minimising digital distractions on everyday digital platforms and the usability of this approach on different applications and devices. As the design of these prototypes prioritised sustained attention rather than other usability criteria, such as learnability or efficiency, some features conflict with conventional design guidelines. For example, our e-book prototype prevented the user from switching to a different app/task, helping save cognitive switching costs for better-focused reading. However, such prevention inevitably takes away control/flexibility from the user. We plan to work on using these conflicting points identified to analyse the implications of the existing usability criteria, principles, and guidelines and discuss how to make sense of designing for sustained attention.

This work contributes to the HCI community by demonstrating how the interaction design could and should start more pro-actively taking into consideration the users' attentional abilities as part of the design and how such a stance might manifest as a factor to be balanced among other conventional usability criteria that have worked so well in creating easy-to-use and efficient interactions. As the impacts of long-term use of our everyday technologies on our cognition are becoming more known, it is important that the interaction design field responds to them by re-considering, re-adjusting, refining, and augmenting our design knowledge, know-how and skill base accordingly and start producing new generations of apps and services for people's cognitive well-being.

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