
How Blocking Distractions Affects Workplace Focus and Productivity

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Abstract

Information workers are faced with ever-increasing online distractions in the workplace. Website blockers are one solution toward preventing unwanted distractions. We conducted an *in situ* field study with 32 information workers in their workplace to test if the use of blocking software can increase focus and productivity by preventing non-work-related distractions. Participants worked for five days in a baseline condition and then worked five days where online distractions were blocked with software. We discovered that with blocking software, participants assessed their productivity significantly higher and could focus significantly longer. People who benefited the most from the software were those who were most distracted by social media. Interviews revealed individual differences in self-control in managing distractions. Resultant changes in work behaviors included switching from online distractions to physical breaks of leaving the office. An unexpected consequence of cutting off distractions for people with less self-control was that they were more focused and worked longer without taking breaks and therefore, experienced higher stress. We present design recommendations to promote focus for the variety of coping behaviors we observed.

Author Keywords

Distractions; workplace; social media; focus; interruptions; multitasking; *in situ* study

ACM Classification Keywords

H.5.3 [Information Interfaces and Presentation (e.g., HCI)]: Group and Organization Interfaces; K.4.m [Computers and Society]: Miscellaneous.

Introduction

In this current paper, we report results from an *in situ* study, to determine whether a software tool with the goal of promoting focus results in productivity and positive affect in the workplace. Building on prior work in the fields of CSCW and HCI, we studied *in situ* behavior, allowing us to gain an ecological view into how human perception and online activity are related. To our knowledge, this is the first study that has studied effects of an intervention in the workplace accompanied by survey items and interviews, to get a fuller picture of how workplace distractions affect information workers.

Solutions for combating workplace distractions

Adaptivity (i.e., using machine learning to understand a user's rhythm of work) notwithstanding, there are two basic approaches used to block online distractions. The first is through increasing user awareness by presenting users with analytics of how much time they have spent on various sites such as productivity apps, social media, email, and other Internet sites. Commercial products of this type include, for example: Delve Analytics [2] Focus [4], Focusbooster [5] and RescueTime [16]. The prototype meTime was found to reduce the time spent in noncritical activities [21].

A second approach is by filtering or blocking sites and applications that can distract from work. Again, commercial products exist, such as Stayfocused [19] or Freedom [6]. AppDetox [9] is a prototype that allows users to set their own rules for blocking apps on their smartphones. These types of apps allow users to set times and preferences for those sites that they want to block. The Pomodoro technique [15] is a popular method that encourages users to more effectively regulate their time, but it does not block distractions.

However, while it has been investigated how undesired notifications can be blocked and filtered, e.g. [13, 14], and while there is promise shown in making users aware of their computer usage [21] there is a lack of research on how work might be impacted by filtering sites that are potential distractors for self-interruptions.

Research Questions

Our overarching research question is: *how do distractions affect workplace behavior?* Based on past studies of how distractions affect work, we propose the following research questions.

RQ1. Do fewer distractions in the workplace affect people's cognitive absorption in their work? Per current theories of attention, people have a limited capacity of attentional resources [22]. Switching attention among different activities can deplete people's cognitive resources that can be devoted to focusing on any given task [17]. Distractions on the other hand could replenish one's mental resources leading one to become more absorbed in work.

RQ2. Do fewer distractions in the workplace affect perceived productivity? Task-switching has been shown

to increase the time it takes to complete tasks, in contrast to mono-tasking, or working on one task to completion before switching to another [1]. With fewer distractions, and thus, increasing the time and focus on the task, people might experience higher productivity at work. On the other hand, social media, a large part of workplace distractions, can provide benefits for productivity. One study showed that people tend to take digital breaks when they feel less productive [3]. Thus, digital distractions could help people refresh. We investigate whether cutting off distractions would lead to an increase in perceived productivity.

RQ3: Do fewer distractions in the workplace affect perception of workload? A laboratory study showed that introducing interruptions into a simulated work environment caused an experience of workload to increase [12]. When less attentional resources are invested in managing interruptions, this could free up more resources to devote to a work activity. However, interruptions, particularly lightweight activity such as social media use, could lessen workload through breaks [10]. We investigate whether reducing workplace distractions should result in a lower assessed workload.

RQ4: Do fewer distractions in the workplace affect stress in the workplace? It has been shown experimentally that stress increases with interruptions [12]. While interruptions can offer a mental break from work, having to reallocate mental resources due to dealing with an interruption can also increase stress. We therefore investigate whether decreasing distractions would also decrease stress.

Method

We conducted an *in situ* study with 32 participants (15 females, 17 males). We recruited volunteers through email advertising. Participants were all information workers who worked in a research division of a large U.S. west coast corporation in varied job roles: administrative assistant, researcher, technologist, and manager. Participants gave informed consent and were given a gift card at the end of the study. One participant was discontinued from the study as she stopped coming to work and was unreachable. We thus used 31 participants in our analysis.

The study lasted two workweeks (10 days) with two conditions: a baseline week followed by a week where non-work-related sites were blocked. We chose a period of one work week based on [11] who found effects after five days of cutting off email. Two participants had a break of one week and two weeks, respectively, between their baseline and intervention weeks due to their schedules. The conditions were:

Week 1: Baseline. In the first week, participants were instructed to work as they normally would, with full use of their computer and phone.

Week 2: Blocking nonessential worksites. In the second week, participants were also instructed to work as they normally would except that we used software to block sites nonessential for work during work hours.

Blocking non-essential websites

Participants installed Freedom software [6] that blocks websites on their computer. The default setting includes a blocklist of 22 sites which mainly comprise social media sites of Facebook, Instagram, Youtube,

Reddit, and Twitter, etc., but also Amazon, eBay, and news sites. Participants were instructed to add sites to this list that they might potentially check over the week that were nonessential to work. We made the explicit decision to allow participants to choose which sites to add to the default list as they were better aware of what sites distracted them and also so that they would have a sense of control, as opposed to being assigned additional sites to block. Freedom software does not allow webpages to load that are on the blocklist.

Measures.

At the end of each day, participants filled out a survey, and reported if that day was a typical work day or not, and if there were any unusual circumstances that occurred that day that might affect their results. They also filled out an end of week, cognitive absorption [1], workload [7], stress, susceptibility to distraction, and UPPS impulsivity scales [20].

Results

RQ1. Cognitive absorption

To address RQ1, we compared baseline and intervention measures of the five subscales of the Cognitive Absorption scale [1]: Focused Immersion, Temporal Dissociation, Enjoyment, Control and Curiosity, all based on a 7-point Likert scale. We created an additive index for each subscale, combining all items. Results of paired t-tests of the Blocking week compared to the Baseline week are shown in Table 1. P-values are adjusted with the Holm's method [8] and show that participants experienced significantly more Focused Immersion in their work when distractions were cut off, as expected. Contrary to our expectations, participants also experienced *less* Temporal dissociation when distractions were cut off.

Having found a significant effect of Focused immersion when distractors were cut off, we next examined how this effect related to people's tendency to be distracted by social media. Participants were asked in the survey how distracted they were by social media, using a 7-point Likert scale. We looked at whether a positive relationship existed between the assessed amount of social media distraction and the difference in Focused Immersion of week 2 (blocked condition) minus week 1 (baseline). A larger value indicated that one achieved a greater gain in focus in the blocked condition compared to the baseline. A linear regression showed a significant positive relationship: the more a person reported being distracted by social media, the greater was the increase in focus gain when nonessential worksites were blocked: $F(1, 30)=8.15, p<.008, \text{coeff}=1.93, \text{adj. } R^2=.19$. Thus, a person's reported susceptibility to social media distraction explains 19% of the variance in their focused immersion gain, quite a fair amount.

| RQ1. Cognitive Absorption dimensions | Total (SE) Baseline | Total (SE) Blocking | t(30) | p |
|--------------------------------------|---------------------|---------------------|-------|-------|
| Focused immersion | 22.94 (1.0) | 25.71 (1.04) | 2.80 | .01* |
| Control | 10.29 (.37) | 10.52 (.38) | .54 | .60 |
| Temporal dissociation | 26.13 (.70) | 24.32 (.91) | -2.85 | .008* |
| Enjoyment | 20.00 (.79) | 18.32 (.86) | -2.19 | .04 |
| Curiosity | 9.39 (.41) | 8.94 (.39) | -1.24 | .23 |

Table 1. Paired t-test results (Blocking - Baseline) of Cognitive Absorption subscales: Focused immersion, Control, Temporal dissociation, Enjoyment, and Curiosity. *Significant based on Holm's method [8].

Design Recommendations

Enabling user control.

Software which allows users to set goals for uninterrupted work time, could help users learn self-control over distractions.

Personalized and adaptive workflow. A smart tool could provide blocking based on the user's pattern of use.

Productive breaks. Some participants took more physical breaks with online distractions blocked. Software could recommend more healthy breaks, such as taking a walk.

Microbreaks. Working long stretches is physically and mentally tiring. Software could enable small "nuggets" of breaks, or microbreaks [18] e.g. 30 seconds to a few minutes, enough for a person to refresh. The system could learn from users' behavior and emotional state when breaks might be useful.

| | Total (SE) Baseline | Total (SE) Blocking | t(30) | p |
|-------------------|---------------------|---------------------|-------|------|
| RQ2. Productivity | 26.81 (1.14) | 30.59 (1.11) | 3.79 | .001 |

Table 2. Results of cutting off online distractions on Productivity

RQ2. Productivity

Our second research question assessed whether productivity would be higher if nonessential websites were blocked. At the end of each week, participants were asked to assess their productivity for the week based on six dimensions. The means for individual summed productivity assessment for Week 1 and Week 2 are shown in Table 2. A paired t-test showed participants in the Blocked condition reported being significantly more productive compared to Baseline.

RQ3. Workload

Our third research question addressed how cutting off nonessential work sites affects workload. Participants completed the NASA TLX workload scale [7] at the end of each day. Combining all six workload items into an additive index, a comparison of week 1 (baseline) with week 2 (blocking) using a paired t-test showed a trend that workload was higher when sites were blocked (Table 3). Applying the Holm's method [8] to adjust the p-values for multiple comparisons for the subscales, the results show that participants felt a significantly *higher* temporal workload in the Blocked condition: Mean difference=.80, SE=.27, t(30)=-3.03, p<.005. The other subscales were not significant.

RQ4. Stress

Our fourth research question covered stress. From the interviews, we coded the data into those who reported feeling more stressed in the Cutoff condition, those who

| | Mean (SE) Baseline | Mean (SE) Blocking | t(30) | p |
|---------------|--------------------|--------------------|-------|-----|
| RQ3. Workload | 5.22 (.16) | 5.49 (.17) | 1.82 | .08 |

Table 3. Results of cutting off online distractions on Workload.

felt less stressed, and those who felt no difference. Only one participant reported feeling less stressed in the Blocked condition, so we combined that data with those who reported no difference. We found 16 participants reported experiencing more stress in the Blocked condition and 15 people felt no difference or less stress (one person).

Individual differences in stress

Given that we found there were two distinct groups with different stress experiences, we set out to examine if individual differences could explain this. We hypothesized that individuals who experienced more stress might be more impulsive, i.e., the software blocked their impulse to distract themselves, leading to stress. We also hypothesized that there could be individual differences in self-control, since those experiencing more stress might feel less in control if their source of relieving stress (online non-work sites), were cut off. Independent t-tests done on the UPPS Impulsivity dimension scores, between the group that reported more stress (N=16) and those who reported no difference or less stress (N=15), showed that those participants who reported higher stress in the Blocked week scored significantly higher on the UPPS impulsive dimensions of Lack of Premeditation: t(29)=3.28, p<.003, and Urgency: t(29)=2.80, p<.009. There was no significant difference found for the dimension of Lack of Perseverance.

We had measured control through the Control subscale of the Cognitive Absorption scale. A t-test showed that in the Blocked condition, those who reported higher stress also experienced *less* control $t(29)=2.24, p<.03$.

Thus, participants experienced higher productivity, deeper focused immersion, and higher temporal demand when online distractions were cut off. About half the participants experienced more stress as well. These participants could be characterized as being more impulsive (lack of planning and inability to control their actions), and feeling less in control of their work.

Conclusions

In our digital age, distractions from social media and other sites occur freely in the information workplace. As a result, a number of commercial solutions and workplace policies have been developed to address their presence. Rather than ask people hypothetically how they feel about distractions, we created an *in situ* environment where people had non-work distractions cut off, enabling them to experience how it affected their work. Cutting off distractions provided significant benefits of increased productivity and focus; on the other hand, there are individual differences in experiencing temporal demand and stress. These results point to the importance of developing solutions for adaptive interruptions that can better integrate into work practices. Design recommendations are presented in the sidebar on the previous page.

References

1. Ritu Agarwal and Elena Karahanna. 2000. Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly*, 24 (4). 665-694.

2. Delve Analytics. <https://products.office.com/en-us/business/explore-office-delve?tab=Discovery>.
3. Daniel Epstein, Daniel Avrahami, and Jacob T. Biehl. 2016. Taking 5: Work-breaks, productivity, and opportunities for personal informatics for knowledge workers. *Proc of CHI 2016*, 673-684.
4. Focus. Retrieved 2016. Available at <http://masterbuilders.io/>
5. Focus booster. Retrieved 2016. Available at <https://www.focusboosterapp.com/>
6. Freedom. 2016. Retrieved 2016. <https://freedom.to/freedom>.
7. Sandra G. Hart and Lowell E. Staveland. 1988. Development of a multi-dimensional workload rating scale: Results of empirical and theoretical research. In P.A. Hancock & N. Meshkati (Eds). *Human mental workload*, Amsterdam: Elsevier, 139-183.
8. Sture Holm. 1979. A simple sequentially rejective multiple test procedure. *Scandinavian journal of statistics*, 6, 65-70.
9. Markus Löchtefeld, Matthias Böhmer, and Lyubomir Ganev. 2013. AppDetox: helping users with mobile app addiction. *Proceedings of Mobile and Ubiquitous Multimedia'13*. ACM, New York, NY, USA, Article 43, 2 pages.
10. Gloria Mark, Shamsi Iqbal, Mary Czerwinski, and Paul Johns. 2014. Capturing the mood: Facebook and face-to-face encounters in the workplace. In *Proceedings of CSCW '14*, ACM, New York, NY, USA, 1082-1094.
11. Gloria Mark, Stephen Vaida, and Armand Cardello. 2012. A pace not dictated by electrons: an empirical study of work without email. *Proceedings of CHI'12*, ACM, New York, NY, USA.
12. Gloria Mark, Daniela Hausstein, and Ulrich Kloecke, 2008. The cost of interrupted work: More speed,

- more stress. *Proceeding of CHI'08*, Florence, Italy, ACM Press, pp. 107-110.
13. Daniel McFarlane. 2002. Comparison of four primary methods for coordinating the interruptions of people in human-computer interaction. *Human-Computer Interaction*, 17(1), 1-61.
 14. Martin Pielot and Luz Rello. Productive, Anxious, Lonely-24 Hours Without Push Notifications. *arXiv preprint arXiv:1612.02314* (2016).
 15. Pomodoro technique. 2016. Retrieved 2016. <http://pomodorotechnique.com/>
 16. RescueTime. 2016. Retrieved 2016. <https://www.rescuetime.com/>
 17. Joshua S. Rubinstein, David E. Meyer, and Jeffrey E. Evans. 2001. Executive control of cognitive processes in task switching. *J of Exp'l Psychology: Human Perception and Performance* 27.4: 763.
 18. Anya Skatova, Ben Bedwell, Victoria Shipp, Yitong Huang, Alexandra Young, Tom Rodden, and Emma Bertenshaw, 2016. The Role of ICT in Office Work Breaks. *Proceedings of CHI'16*, 3049-3060. ACM.
 19. StayFocused. 2016. Retrieved 2016 from <http://www.stayfocusedapp.me/>.
 20. S. P. Whiteside and D. R. Lynam, D. R. (2001). The Five Factor Model and impulsivity: using a structural model of personality to understand impulsivity. *Personality and Individual Differences*, 30(4), 669-689
 21. Steve Whittaker, Vaiva Kalnikaite, Victoria Hollis, & Andrew Gudysh. 2016. 'Don't Waste My Time': Use of Time Information Improves Focus. *Proceedings of CHI'16*, pp. 1729-1738.
 22. Christopher D. Wickens, 1980. The structure of attentional resources. *Attention and Performance VIII*, 8.