Self-control and Technology Usage

by

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Explore ways to promote moderate technology-usage hygiene

Abstract:

Excessive technology usage has been gaining more attention for the past decades. While empowering human productivity, digital activities are also trapping people into overly long and intensive usage especially to the younger generations (Twenge,2017). In order to moderate tech-usage and maintain good digital hygiene, one's self-control capability plays a great role. This paper aims to explore 2 self-control strategies' effect on people's technology usage. A mixed methodology of semi-structured interviews and single-case experiment was conducted on 14 graduate school students who heavily rely on digital platforms for work and study. Both quantitative data of participants' actual non-productive length ratio and qualitative data of the 28 interviews were analyzed. The non-productive ratio remained at the same level for both strategies.More in-depth discussions around the distraction sources, distracted reasons and the 2 strategies effect are provided in the qualitative affinity analysis. Possible recommendations for future improvement on moderate tech-usage are also discussed.

Introduction and background:

Technology usage has become more ubiquitous than ever before. Industrial leaders and scientists are proudly smartifying ordinary objects to make human life surrounded by information and the provided conveniences. While it is true that we are hugely benefiting from modern technology for information access, storage, process, and analysis, there are also a growing number of voices accusing high-tech of dismantling people's self-control capability, especially to the young generation(Twenge,2017).

Typically, young adults and teenagers born after mid 1990s ('Gen Z') spend around 6 hours a day on digital media in their leisure time alone (excluding usage for work and school) -2 hours of instant chatting, 2 hours streaming and surfing, 1 ½ hours on social media, and another 1 ½ hours playing games on smartphones and consoles a day (Twenge,2017). From year to year, American adults' media consumption has maintained at 10 ½ hours a day steadily (Nielsen,2018). "Internet addiction", first

proposed by psychiatrist Ivan Goldberg based off of criteria for substance dependence and pathological gambling in 1995, is not included in the DSM-V (The Diagnostic and Statistical Manual of Mental Disorders) as an official disorder due to a lack of , but people are realizing it's bad influences dearly every day.

An increasing amount of research has shown the negative relationships between excessive technology/internet usage and people's cognitive processes (Hadlinton,2015); workforce and academic performances (Young,2004); emotional, physical and social well-being (Cheever et.al., 2018).

However, unlike drug or nicotine addiction, excessive technology usage cannot be treated through total abstinence since on one hand, it's highly unlikely, if not impossible, to avoid interacting with technology. We rely on technology from trivial daily chores like ordering food, communicating with friends, paying bills to serious occupational tasks such as writing papers, conducting complicated calculations and designing for more technologies. Depart oneself from technologies is like isolate a men from the whole society. On the other hand, efforts to achieve total abstinence can easily lead to overly extreme treatments. For example, desperate parents send their children into "addiction treatment camp" where illegal electric shocks are used to "discipline" and "cure" teenagers' technology addiction but causing more permanent damages neurally and emotionally instead (BBC China). As a result, the key is how to moderate individual's IT usage to retain an overall healthy tech-usage hygiene.

To respond to the issues above, I sought to understand how to maintain a moderate technology-usage hygiene by looking into frequent-tech users' daily digital working habit, their key distracting sources and the distracted reasons accordingly. More importantly, what are the self-control strategies that are useful and preferred by people? What self-control strategies or aspects of them work the best in terms of promoting one's productivity, self-satisfaction and sustainability (would keep using)? The answers of these questions would be of great importance for us to fully utilize the power of technology but not overwhelmed by modern IT's pervasiveness.

Related Work

Self-control strategies

Self-control, also known as self-regulation, self-discipline, willpower and effortful control refers to "the ability to alter one's incipient state and replace it with another" for the sake of long term goals (Baumeister,2002). A wide range of research has shown that good self-control is a robust predictor of better performances from academic achievements to healthy behavioral choices. (Baumeister & Tierney 2012). 4-year-olds with higher self-control capability tend to score higher in standardized tests (SAT) and other developmental competencies later in life (Mischel et.al, 1989). Similarly, they tend to have better physical and mental health, have less substances abuse problems, live in better financial situations and obtain smoother interpersonal relationships (Moffitt et.al, 2010, Tangney et al., 2004). Self-control is arguably the most important personality trait for one's well-being.

According to the current pioneering self-regulation researcher, Dr. Roy Baumeister, there are 3 key elements of effective self-control, standards (ideals/goals for desired response), monitoring (a tracking system for the behaviors) and the capacity to change (one's ability to take actions toward the goal). Research also distinguishes between *state* self-control and *dispositional* self-control (Tangney et al., 2004) where state self-control is highly versatile and contingent to situational factors like mood, and motivation (Hofmann, Baumeister, Förster & Vohs,2012). The dispositional self-control on the other hand is a personality trait that is relatively stable throughout one's lifetime. Under the current study scenario, we are more concerned about state self-control, and how to improve the situation and context to help people stay focus longer.

Various strategies and models have developed to boost one's self-control capability over the past 2 decades. For one's dispositional self-control, the only strategy proposed is to practice daily small self-control act like correcting one's posture, or limiting glucose intake to gradually develop a better self-control trait (Muraven,Baumeister & Tice, 1999). When it comes to the moments of temptation, that individuals have to choose between falling for hedonic impulses or exerting self-control to do what's reasonable, more diverse strategies were suggested. Most of these models concern some operations to secure a goal, examples are boosting up the value of the long-term goals via forging automatic link between temptation and higher-priority goals (Fishbach,Friedman, & Kruglanski, 2003); making specific implementation intention plan

to complete goals (Gollwitzer, 1999,Gollwitzer & Brandstatter, 1997); more details will be discussed in the later section about this strategy;

More often, researchers self-control strategies have to be used proactively so that people exert self-regulation in advance for later moments of temptations. Such proactive self-control strategies include increasing valence of short-term outcomes to improve chances of choosing according to long-term goals (Y Trope, A Fishbach,2000); inducing “mood freezing” manipulation to eliminate negative consequences on self-control during emotional distress situations (Tice, Bratslavsky & Baumeister, 2001) andvarious delay of gratification strategies like cognitive appraisal and transformations (Mischel, & Baker, 1975).

To narrow down the research scope, the current study limits the scenario to when one has to finish individual focused works. Examples are individual course assignments and course projects. There are 2 reasons for choosing this target setting. First, one already has a goal in mind when trying to finish some courseworks so the basis (standards) for initialize one’s self-control is met. Second, such scenario means people have to mostly rely on one’s own state and self-control capability to stay focus. This would help reduce other confound factors like peer pressure form study companions.

The current study chooses 2 self-control strategies (one technological and one behavioral) The website-blocker and the implementation intention planner to further study the possible countermeasures against technology overuse during focused individual working sessions. Albeit the breadth and depth of excessive tech-usage impact on our daily life, seldom has research studied directly and specifically about how to reduce the negative influences. Therefore, the current research would have value on discovering the unique challenges that digital contexts posted to our self-control and tools that we can draw from self-control strategy frameworks.

Technological strategy: Website Blockers

Quite a few self-control or productivity strategies are available within digital realm, although most are sub-features under the broader umbrella of time-management, project management and productivity products (GetApp,2019). One of the most popular category is called GTD (Getting Things Done) apps, developed by time-management consultant, David Allen. He proposed a 5-step method-- Capture, Organize, Clarify, Reflect and Engage, to achieve a stress-free productivity (GTD,2019) and endorsed a series of digital products that exercised the methodology including, Evernote, OmniFocus, Trello, and Windows Outlooks etc (GTD, 2019).

For the purpose of the current study, only the last stage of the GTD steps, engaging with tasks is considered. From software review websites like GetApp and Capterra's feature filter for time-tracking and productivity tools, it appears that the most typical features aiming to reduce distractions and boost productivity are : access control, time-tracking, activity management, pre-set timers, email and browser notifications.

Because technology usage is normally highly automatic and habitual, it's important to exert impulse control when the sudden habit/urge of getting detoured or distracted when using technology happens. Thus, access control serves as the most direct barriers to the small, immediate rewards (distracting digital activities). Such control is usually achieved through blocking one's access to websites or other internet-rendered services like mail servers that users found distracting for a period of time. For this reason, Website Blockers became the first strategy adopted in the current study.

Additionally, the proliferating amount of digital productivity tools suggests a current trend of using technological solutions for technological hardships. However, seldom has research systematically tested out the effectiveness of these tools. The current investigation thus would provide certain insights on how digital natives' experiences and satisfaction levels on this approach.

Behavioral Strategy: Implementation Intention planner

Within literature, the effort to understand self-control constructs largely builds upon goal concept that covers a wide spectrum from long-term aspirations (finish a PhD degree) to short-term endpoints (finish an algebra homework). Self-control is exerted when we choose "a delayed but more valuable outcome over a more immediate outcome that is ultimately of less value" (Ainslie, 1975)

Using digital devices to finish works albeit the numerous sources of distractions is a constant tug of war between sticking with the planned goal and falling for the spontaneous impulse. While the first strategy in the current study, Website blockers aim to cut down the access to distraction sources, the second strategy, Implementation Intention planner strives to help people fulfill their pre-planned goals (finish individual focused tasks).

It has been consistently suggested that specific, difficult goals tend to have higher performances than vague, general goals like "do your best" (Locke & Latham, 1990).

Gollwitzer has proposed the difference between “goal intention” and “implementation intention” (Gollwitzer, 1993) where a goal intention sets up a target, but the implementation intention provides the actionable steps to achieve the target goals by specifying when, where and how a goal-directed response will be carried out (Gollwitzer, P. M., Fujita, K., & Oettingen, G.,2004). Therefore, the specificity of implementation intentions activates the mental link between critical situation and specified response and thus semi-automate the initiation of desired responses.

Because of this underlie psychological process, implementation intention has shown a fair amount of promising effects on goal-attainment for wanted behaviors that had to be acted on inconvenient timings (Gollwitzer & Brandstätter, 1997); goal attainment rate for necessary yet somewhat unpleasant actions like health screening tests (Sheeran & Orbell, 2000). More importantly, it also helps with goal-shielding once the goals are initiated, from unwanted behaviors and thoughts (Achtziger, A., Gollwitzer, P. M., & Sheeran, P, 2008).

The strength model has described our self-control as a finite amount of power that fed by glucose, yet decision-making is one of the most tiring mental activities that in turn harms one’s self-control for taking actions on the actual tasks that’s decided upon (Vohs et.al, 2014). The automation induced by Implementation intention saves the mental energy and helps people to cross the rubicon.

Method:

Design and Procedure

To best answer the research questions, a mixed methods of single-case experiment and semi-structured interviews were conducted. 14 study participants were randomly assigned into two groups to try out digital (Website Blockers) and behavioral (Implementation Intention Planner) self-control strategies with a cross-over design (10 days) to control for ordering effect. The first 2 days’ data were collected for setting up baseline level of digital usage. Participants didn’t use either of the self-control strategy but submit their daily usage report. The next 8 days’ period was intervention phase where, the first group of 7 participants used Web Blocker for 4 days and the Planner for another 4 days. The other 7 participants used Planner first and then Web-blocker.

All of the participants were interviewed before the study trial. During the pre-test interviews, participants talked about their general working habits when using digital devices, the main digital distraction sources and reasons for their current difficulties of restraining from digital distractions. Then, they were instructed to install a third party digital activity tracking software called RescueTime.

Once the study trial unfolded, participants were required to submit their daily digital activity usage reports that generated by RescueTime to researcher upon request and fill out a satisfaction questionnaire for their self-regulation capability of the day. The collected activity report is shown in figure 1, separated by each hour of the day. All the website visited on Google Chrome browser, and software apps used during that particular hour are listed in a descending order. A simple data visualization showing in bar-graph is also provided, color coded with RescueTime preset categories for activities.

After the study trial, all participants were interviewed again for their views and feelings about using the self-control strategies.

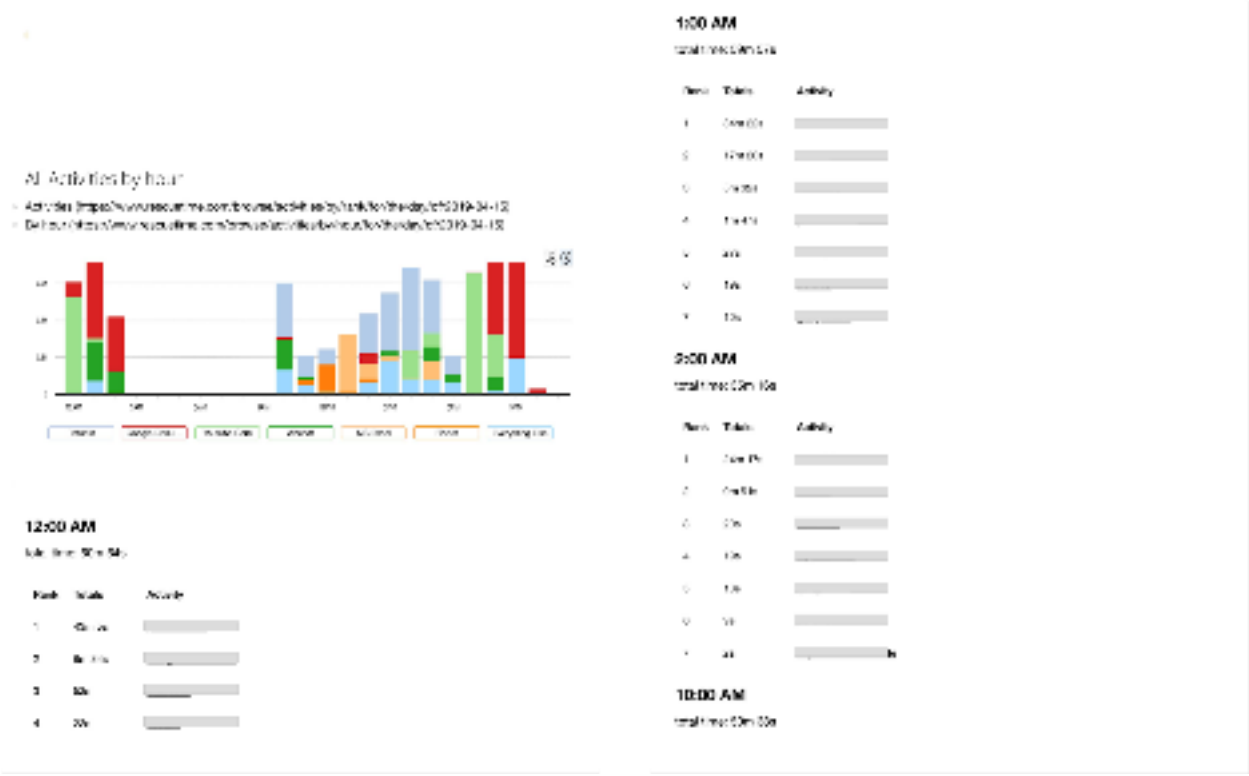


Figure.1 Sample RescueTime daily digital activity report

Participant:

14 University of Michigan graduate students from the School of Information (10 female, 4 male) were recruited to participate in the study. 4 participants are pursuing their Phd degrees and the rest are master students. They all expressed the intention to increase current self-regulation capability and stay focus longer in working sessions. The reason for recruiting only graduate students is because most of their works are fit with the target research scenario, individual focused works, which heavily rely on one's self-control capability.

Results and Findings :

Quantitative analysis:

The collected 10 days' digital activities were categorized into 3 types, distracting, productive and time-contingent. The categorization is based off of comments received from Pre-trial interview data. Distracting activities are mainly social media sites like Facebook, twitter and online shopping websites (Amazon). Productive activities are office softwares like Google-suite product and Adobe Readers. Finally, during the interviews, all participants reported a group of activities as largely situation and time dependent in terms of productivity. For example, one can use Facebook Messengers to casually chat with friends but there are also times where team-members would exchange information and resource via the same platform. These activities are Instant Messages logged on desktop windows (WhatsApp, Wechat etc.), Emails, News, Blogs and work relevant reference sites (New York Times, Medium, dribble, Linkedin etc). Hence, they are categorized as time-contingent.

Non-Productive Ratio

To see if the assigned self-regulation strategies have any effect on participant's productivity, The non-productive ratio (total non-productive activity length to total activity length) becomes the key measure of the study. Calculation is shown below.

$$Non\ productive\ ratio = \frac{total\ non{-}productive\ activity\ length}{total\ activity\ length}$$

Before computing the actual effect from each strategy, the overall usage percentage for each category across the 10 day period is shown in figure 2a, where productive activities consistently take up the majority of user's time when using their PCs. The non-productive activity usage length and ratio for during baseline, web-blocker and planner period are shown in figure 2b, 2c.

From the Figure 2b and 2c, it's clear that although the total non-productive activity length is increasing over the course of the study, non-productive ratio appears to decrease from the baseline period. To see if this decrease is statistically significant, a mixed linear model is adopted to calculate the effect of each strategy on people's baseline non-productive ratio.

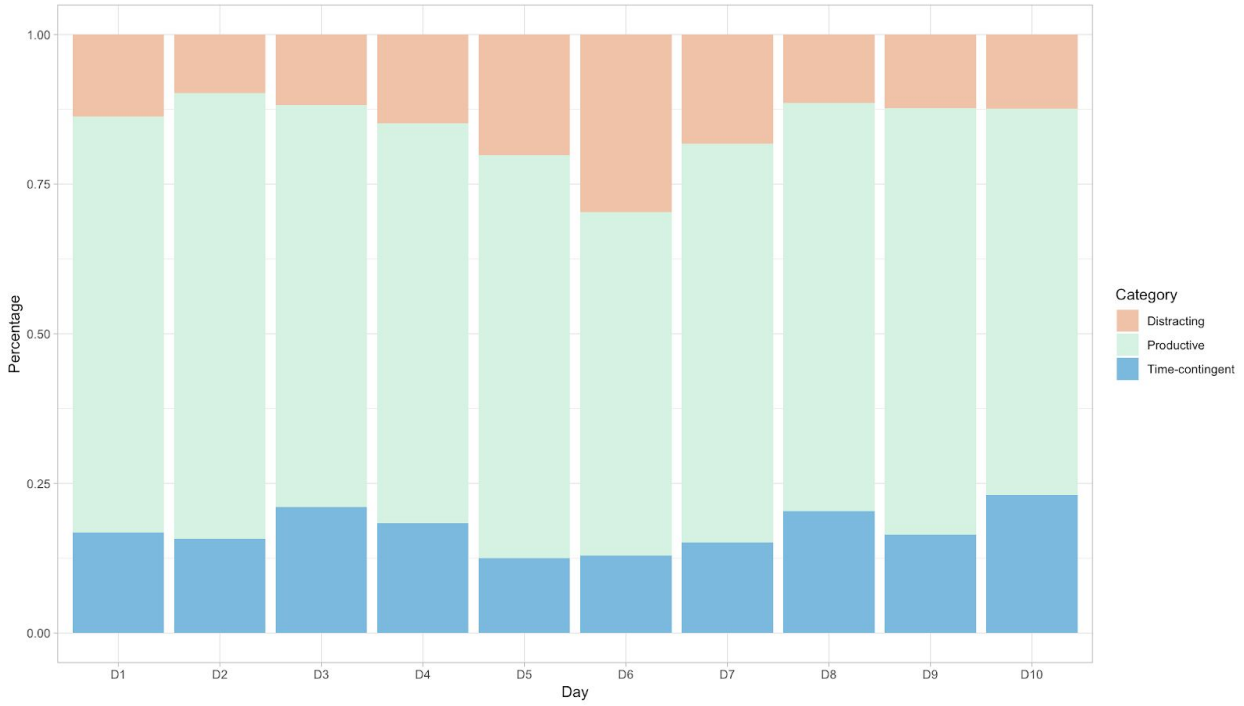


Figure.2a, overall usage breakdown

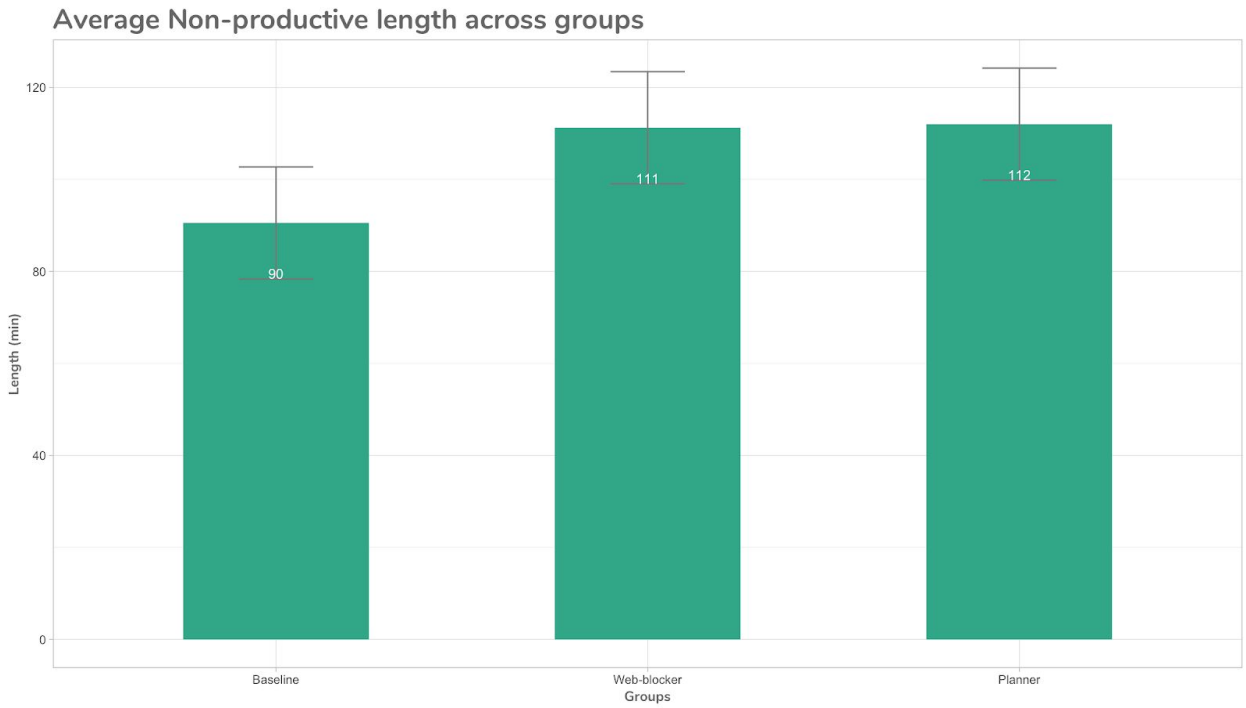


Figure 2b. Average Non-productive length across groups

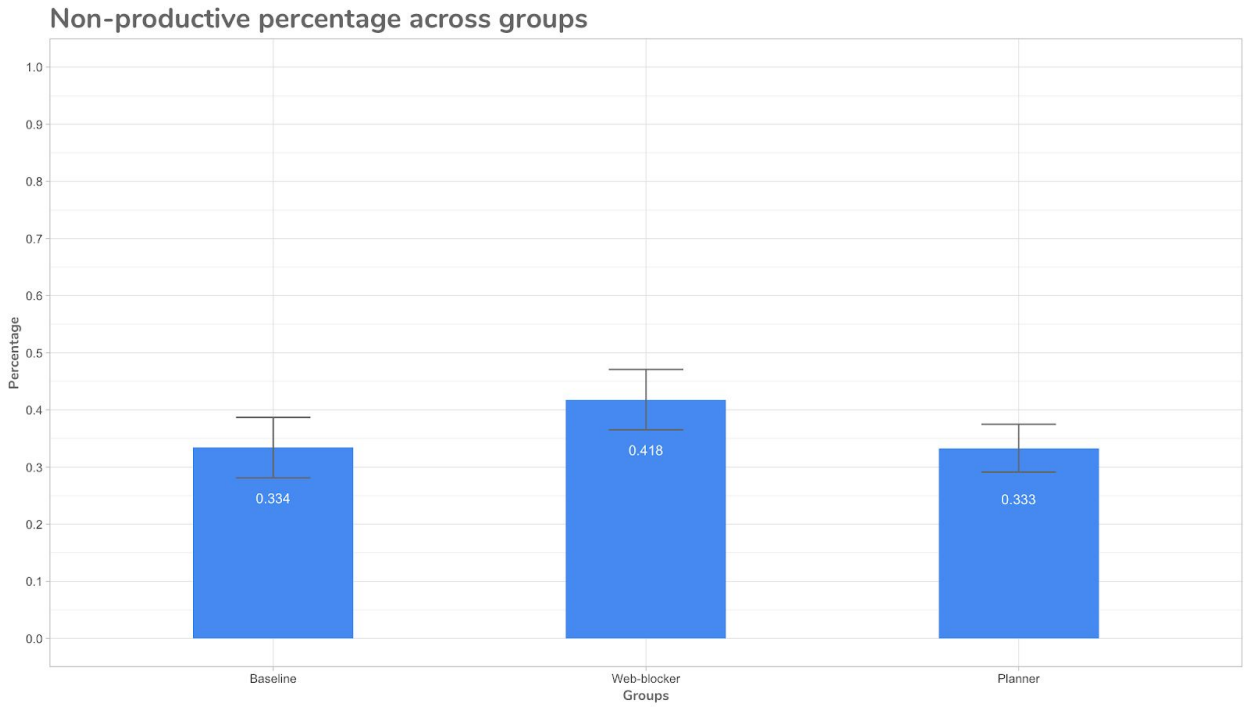


Figure 2c. Non-productive ratio across groups

To see the effect brought by each self-control strategy, a linear mixed effects model is used and expressed as:

$$y_{ij} = \beta_0 + \beta_1 * Blo_{ij} + \beta_2 * Pla_{ij} + e_{ij}$$

Where and Blo_{ij} and Pla_{ij} are binary variables. Blo_{ij} represents the Web- blocker strategy and Pla_{ij} represents the planner strategy. The first effect is Web-blocker and the second is Implementation Intention Planner, E is the error term. As shown below, neither of the strategy has a significant effect on the decrease of people's non-productive ratio over the course of the study.

Estimates of Fixed effects				
Parameters	***Estimate***	***SE***	**t *Value***	***Sig. (p)***
Non-Productive Ratio - intercept	0.331	0.052	6.343	2.11e-07 ***
Non-Productive Ratio - blocker	0.048	0.046	1.035	0.303
Non-Productive Ratio - planner	0.031	0.047	0.663	0.509

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

However, due to a series of constraints, participants' technology activity data captured in the study is by no means comprehensive representation of their digital behaviors. Some key reasons for this under-representation are:

1. 10/14 participants reported that most of their distractions came from mobile phones. 1 person's distraction largely came from non-digital activities (noise).
2. RescueTime is not able to capture browsing data under incognito mode

3. Subjective data nuances is missing from the category data. Almost all of the participants reported that they would use social media or Youtube as learning sources while RescueTime would categorize these activities as distracting.

Qualitative Analysis

Based on the general analysis from Quantitative data, I dug further into the interview data by affinity analysis. All 28 interviews were transcribed and around each minute of interview data was annotated into a brief stand-alone insight. These insights notes were further clustered with similar themes and eventually produced a hierarchy. conducted an affinity analysis for both pre-test interview and exit interview data, and found more in-depth findings about digital natives general working habit, main distraction sources and reasons.

Before the study trial, the pre-test interview results are largely grouped into 3 parts, general working habits of people when using electronic devices to finish individual focused works; current main digital distraction sources during working and self-regulation goals for technology usage hygiene.

With the main distractions and participants' self-control goals in mind, the exit interviews was conducted to get an understanding on their subjective experiences of using each self-control strategies to restrain from unwanted activities, and if there is any other effect on one's overall self-control strength.

Thus, the exit interview data analysis findings are classified into participants' reviews on Web-Blocker and Planner as a self-control strategy speratedly; Attitude about using self-monitoring personal informatics products and self-rated satisfaction on self-control capability.

People's working habits using digital devices

Most of the participants (10/14) reported mostly finish their individual focused works (course works and projects) from late evening to late night (6pm - 2am). 2 reasons were provided. First, as graduate students, the only times that have big consecutive chunk of time are nights so it's better for people to finish their individual focused works without external interruptions. Second, most courseworks' deadline is set at 11:59pm which gives a heightened urgency of finishing works. However, within the 10 people

work at night, more than half of them reported having the best productivity in the morning, yet they just cannot get up early enough.

Another common theme for people working on electronic devices is the need to warm up before working. In other words, they barely open up laptop and go straight to the target tasks. More than half of the participants have to check their emails before starting any kind of work. 5 participants need to check their planner or to-do list for next steps and 3 reported reading social media posts (Facebook, Reddit) and watching Youtube Videos as a way to decompress or build up the momentum for working.

When asking about taking breaks, all participants take an intentional break every 30 to 45 minutes when using digital devices if there are no external distractions. The breaks' length ranges from 5 minutes to 20 minutes where all of the participants would still stay on some sort of electronic devices during the break. The most mentioned break or relaxing activities are: checking emails; reading social media posts (Weibo, Wechat Moment, Facebook, Reddit, Instagram); Watching online streaming videos (Youtube, Netflix). The most used platform for implementing these relaxing activities is smartphones.

However, more than half of the participants also reported seldom there are cases where one can focus completely without having some sort of distractions happening during the full 30-45 minutes' work sessions. On the worse end of scenarios, one can check emails every 3 to 5 minutes; Scroll social media posts for 10 minutes every 15 minutes of focusing; Carried away by unrelated discounts email to shopping after just starting the work. However, on the other end of the spectrum, if the timelines are really tight or people are making great progress on their works, it's possible to focus for 2 hours straight without any breaks or even having "the intention to take a break".

The main distraction sources during working

Emails

As shown by data, the biggest distraction for participants is email. 10 out of 14 people reported email as a constant distraction and 4 of them directly rated email as the biggest distraction among all. The underlie rationale is tri-fold. First, people have higher tendency to check their emails than other notifications such as laptop system notifications or Instant Messages, because emails tend to have more important information than Instant Messages. Also, more than 4 people mentioned they use " inbox zero" strategy which contributes to the strong impulse to empty inbox or at least

make sure there is no unread email. Second, people receive emails and the according notifications on a high frequency on multiple platforms (laptop, cellphone and tablet). Third, people tend to read through each email regardless of the content, seen from the quote:

"I read through each of my emails, even the commercial newsletters and discounts" (MSC1 & MSC2)

The 3 reasons above thus create a vicious cycle that each strengthens the previous chain. The frequent notifications provide availability and accessibility then the fact that people are prone to email notifications largely increased the likelihood of opening these email notifications. Once the emails are open, people don't just glance at it but take time to read.

Finally, the wide diversity of email content (academic, commercial,Newsletter etc) serves as a springboard for other online activity:

"I read about the discount on the shoe website, then I would click into the online stores and starts shopping" (MSC4)

"I read school newsletters and would click on lots of the links that might interest me" (MSC2)

Instant Messages(IM)

9 out of 14 people said Instant Message such as Whatsapp, iMessages, Wechat and Facebook Messengers is another big source of distractions during working. Within them, 4 people reported to always have their most used Instant Messaging applications open on desktop window so they won't miss the IM notifications from friends and families. In other words, they tend to be multi-tasking under most individual focused work scenarios. Additionally, only 3 people reported that they can wait to respond the IMs until they finish the current ongoing tasks or working sessions. More often, people would respond to IMs right away because *"responding a message doesn't take much time"* or at least glance at the messages to get a general impression of the urgent level.

Reference Seeking

The next most mentioned distractions (4 out of 14 participants) happened during the attempts to gather "needed" information to help finish tasks but actually are not as helpful or productive. These activities are called 'Reference Seeking' in current paper. For example, one participant was looking for templates for a design course project, but even after locating the fit template for the course work already, the participant kept on

downloading more templates because “these are free and what if there are better ones that I haven’t seen.”

Similarly, another participant reported that he would start the the work-related information seeking with a broad keyword on online news and blog platforms like Medium and New York Times. Then he would quickly glance at the titles and preview texts of search results and right-click to open a new tab with the interested articles. Over 10 tabs would be opened in a short amount of time. Next, he started read through the articles but then “*there are more recommended articles based on similarities*” and chances are he would open even more tabs thanks to these recommendations.

When things go wild, the work-related information seeking would gradually become non-relevant information browsing and “you have already forgot your initial goals in mind”. As a result, reference-seeking ends up being distraction-seeking.

Social Media Posts

Not everything about social media is distracting. In fact, only social media posts or social media feeds specifically are reported as distracting by 3 participants. The typical description of getting distracted by Social media posts during work is to pull up cell phone and start scrolling whenever one feels bored, tired, stuck or have made finished a chunk of works.

One thing to be note here is all 3 participants reported mostly using social media apps on mobile phones, thus the phrase “scrolling”. One person does this on purpose to avoid relate laptop and PC with social media usage. This finding reflects the broader current trend of the huge increase of smartphone usage as personal computing devices including entertainment purposes (Lauricella, Cingel, Blackwell,Wartella, & Conway,2014).

The special distraction for work: online streaming videos

During interviews, online streaming videos seem to have a really paradoxical position in people’s mind. 5 people reported watching Netflix, Youtube and Hulu as a relaxing event or even a “treat” for the hard-working, hence they don’t treat videos as distractions per se. However, although videos don’t pump out active notifications that are designed to capture human attention with bold color, bouncy movement in peripheral visions, etc like IM and Emails do, they have the magic to trap people on the sites for overly long period of time, the so called, Youtube spiral.

4 people reported that they have constantly fell into the Youtube spiral during working with the initial intention of watching tutorials, demonstrations or educational materials.

"And Youtube, oh my god. I have to search for tutorials a lot on how to use the [new tools] to finish my research tasks, but that 'watch next' is endless and before I realize, I can spend over an hour watching these things"

Other times, watching videos greatly postponed the starting time for work:

"I started watching Netflix during lunch time, thinking to myself that I am only gonna watch 1 episode, but I always end up watching at least 2 or 3 more episodes than I initially planned"

"You can't even start working because of youtube videos"

To sum up, although videos won't directly distract people when they are working but once people start using video site, it's easy to fall into the video spiral and extended work time.

Key reasons that people are distracted while working

After talking about the main distraction sources, one naturally starts to wonder about the reasons behind the distractions. All participants agreed that it's especially hard to restrain from unwanted digital activity usage and their responses for why it is so gradually converges into 2 reasons illustrated below.

Reason 1: Information overloaded yet we fear of missing out

"*Never have we ever being exposed in so much information before….and constantly being so*", one participant immediately responded when asking about why it is difficult to restrain from unwanted digital activities or limit oneself from being distracted during working. The same reason was brought up by 4 other participants explicitly and supported by most other participants when they used words like "endless amount", "non-stopping" and "too much" to describe getting information via internet.

In other words, we are flooded by information that our attention becomes a scarce resources to allocate. This also partly explains why reference-seeing becomes a top distraction or time-waster rated by the study participants. Quoting from the same participant "*I have too many options[and this] is a major problem"*

Nevertheless, information overload is only half of the story or only showcases the surface of the reason. The other half stems from people's feelings of "the fear of missing out". This exact phrase has been constantly brought up when people talking about each of the distraction source mentioned above.

"I guess it's a fear of missing out that I have to do this..(Reading through each Email)" (Email)

"Well, you would want to know what are your friends up to recently and if there is anything that I should be aware of ". (Social Media posts)

"I don't want to miss out the best tools to use for [the tasks] and then learn a bunch of different tools "(Reference Seeking)

This common feeling of the study participants also resonate with a newly emerged phenomenon, Nomophobia, the fear or phobia of not having one's phone and the related services. There are 4 identified dimensions of nomophobia,(1) not being able to communicate, (2) losing connectedness, (3) not being able to access information and (4) giving up convenience (Yildirim & Correia, 2015). Losing connectedness and not being able to access information seems to be closely tight with the fear of "missing out", missing the connections with friends on social media and with *"important job-posting information from emails",* missing the access to enough information on work referencing.

Reason 2: Digital entertainments and distractions become our first choice for dealing with mental needs

The second common thread about why we are easily distracted by digital distractions regardless of the context is the fact that people use digital activity as self-help therapies for a series of mental needs such as: boredom, tiredness, anxiety/stress and future comprehension.

The majority of participants (10 out of 14) mentioned using digital entertainments (IM, Social media) whenever they feel 'bored' and 'tired'. The actions can be triggered either externally or internally, meaning that if one is bored or tired not only it's easier to get distracted from external stimulus like various notifications, but also he or she is more likely to open distracting sites like Facebook, Youtube and Netflix proactively.

*"For me, it's really an **emotional reason** [of excessive watching Youtube videos]."*

*"I think sometimes the reasons that you would distract from work are not external reasons but rather your **internal mindset**".*

Such internal influences are not just seen in the course of the working sessions, a lot of times, these mindsets' effect starts before we even start our work process. The most typical embodiment of such influence is the tendency to extend starting time of a specific task because:

" it feels that the work is going to be hard and time-consuming that I have to build up and prepare for that but once it started, it's less intimidating… I am extending the starting time."

"[Because] I really don't want to do the works so I would spent a lot of time accumulating information [Reference seeking] before actually start doing. It seems that I am preparing for my works but in fact these information doesn't really contribute much to my work."

"I am more stressful these days for jobs [searching], so watching Youtube videos, and even the really silly ones become a way [to respond to theses stress]."

As mentioned before, The most used break or relaxing activities are all digital: checking emails; reading social media posts; watching online streaming videos (Youtube, Netflix). Only 1 person mentioned she would intentionally do some stretching and walk around during the break time. This work-break habit of people future strengthened the point that we are using using digital activities to help relax, decompress, calm and motivate our minds. Whether these activities truly provided the expected therapeutic functions is however another story to be investigated upon.

Self-control goals during working

Jump in faster and focus longer

Instead of having a clear goal or vision about how much distracting digital activities that they want to reduce, most participants simply wish to stay focus longer on a single task without deviating to something else. In other words, its okay to indulge in the digital entertainments as long as you finish your work. In fact, one participant said that she would love to have a Netflix binge watching episode (~ 10 hours) once for a while. However only 2 people used specific number to describe how long is longer (extend from 20 minutes to 40 minutes' absolute focus time).

Also, people hope to improve their focus quality when doing works, because now *"I just feel the urge to check my phone or social media really frequently",* rather than decrease the amount of usage of a particular kind of digital activities. There are two ways that people are hoping to improve their focus quality; start faster, and don't think of distractions while working.

Start faster means they want to cut down the warm-up activities discussed above. For the other one, it originates from the current pervasiveness of social media that even though people are not using it, they are thinking about it.

"Our life is so intertwined with social media now, if you don't have anything to do, you would definitely go check it. Even if you have things to do, you still think about what you saw or might see on social media posts "

Be mindful and controlled

The second goal that people have for self-control is to be more mindful when using technology in general. 5 people reported that they hope to entertain in a more controlled way and be mindful about their tech-usage more. For example:

"I wish that I can watch just one episode of Hulu when I planned to just watch one."

"I still wish that I can detach from the technology atmosphere more in general "

"... more controlled with the distractions, say cut down my max quota for social media from 45 minutes to 10 minutes."

Outside of distracting activities, participants also wish to be more present and immersed in the actual environments rather than the virtual world behind the screens. Thus not only they are not using the devices but also not thinking about the digital world all the time. Some specifically emphasized situations are, friends and family gathering;Using digital devices in bed both before going to sleep and after waking up.

This goal also resonates with people's behavioral pattern when taking breaks. Most people reported that they never kept track of how much time they spent during the intentional breaks' time, let alone times whey they get distracted passively.

"Usually, it takes at least 5 minutes for me to realize that, oh I am derailed from my current task"

Reduce some distracting digital activities

There are 3 main type of digital activities that people wish to reduce while studying and working. First is online-streaming videos, especially Youtube, mainly because of the "Youtube Spiral", that videos take up the longest of people's time if falling for. Second is social media posts. Study participants specifically mentioned that not everything about social media that they hope to reduce. They much need the actual social part, messaging and video-chatting of social media, but social media posts especially Facebook posts can definitely be reduced.

The next mentioned category is not one specific type of activity but the general sources of any notifications on laptop. Finally, only 1 person mentioned want to reduce IM and Email respectively, although another 2 people explicitly said they have no intention to reduce IM during work time.

Web-Blocker v.s Planner as self-control strategy

To the surprise of author, almost all participants (13/14) had a strong preferences on either one of the strategy. They either strongly preferred using Web-blockers to help focus (6 out of 14 participants) or Implementation Intention Planner for structuring tasks out (7 out of 14 participants). The one person left expressed a slight inclination towards planner but thinks it will lead to the best result should you combine the 2 methods/strategies together.

Thus, here occurs a modest bent towards using Planner than to the Web-blocker. Although not significant, this is also suggested by participants daily rating on the day's satisfaction on productivity level, shown in Figure 3.

Figure 3. Daily self-report satisfaction for assigned self-control strategy

Advantages and disadvantages of Web-Blockers

The biggest advantage about Web-blocker is it's strictness by nature so it's more forceful. 3 participants reported that knowing there is no access to the distracting sites is "releasing" and "relaxing", because the access control saves people's extra mental energy to remember not using the distracting sites. The other good thing about using Web-blocker is it requires minimum amount of human interaction and set up work beforehand. All you need to do is entering your distracting websites and start the timer to cut down your access right.

However, with the arguably endless amount of distractions in digital realm, it's impossible to exhaust your list of things to block access from. Also, it's hard to predict what would distract you before first getting distracted by them. Worst case scenario, you can always find something to do that is non-related with your work.

Advantages and disadvantages of Implementation Intention Planner

On the contrary, the implementation intention planner provides people with enough flexibility to choose from how to actually carry out the steps to finish the tasks. It also lends a structure or clearer picture for people so it's easier to manage different projects using the strategy. Finally, because the planner is designed to be really specific, that

users have to write out when, where and how they would finish the task, this process "raises more awareness of [users] towards the tasks".

Also because of its flexibility, the planner might need some external supervision to make people accountable. As said by participant, *"I don't know about others, but I don't care if I didn't follow the plan as it is."* Thus, the downside about the strategy is it depends on people's work style.

Sustainability of Strategies

Similar to people's preferences, 8 people said that they would keep using the planner strategy in the future, 5 participants would keep using the web-blocker for study and work. However, one person mentioned would keep using RescueTime but none of the other strategies.

As for people's attitudes towards using RescueTime, most people reported didn't receive a strong influence from the tool because first, it does not provide notifications and second, knowing your current usage length for different digital activities does not change one's future behavior too much. Only one person reported being "super conscious" about the data that she would even set up a quota for herself for certain activity usage length.

Self-rated satisfaction on one's self-control capability

During both the pre-trial and exit interviews, research has asked each participants to rate their current satisfaction about the ability to limit oneself from being distracted while working on individual focused works on a scale of 1 to 10 (1 means not satisfied at all, 10 means very satisfied).

The average rating during the pre-test interviews (M = 6.25, SD=1.16) is significantly lower than the post-test interview rating (M= 7.51, SD=0.81). 9 out of 14 people rated 1 point or more than before,1 person rated .5 more higher than before and 2 participants stayed at the same rating level.

Discussion:

Personal electronic devices and digital media are like powerful dragons to warriors. Only the ones knowing how to properly train their dragons, can wield the full potential of these gigantic creatures. The current paper's attempt of utilizing self-control, arguably the most powerful faculty of mankind to promote good tech-usage hygiene, thus acquires a great importance in current era. Reflecting on the key findings from the current study, the main challenges of staying focus on tasks on digital devices and how the self-control strategies might help are discussed below.

The unique challenges imposed in digital contexts

At this point, it is clear that digital contexts imposed quite a few challenges on the attempts to moderate tech-usage. These difficulties are supported by the discrepancy between peoples' distraction sources and reduction intention; the paradox between the increased self-rated self-control satisfaction and their actual performances and the destructing power of digital distractions on one's goal-setting process, yet having a clear goal is the starting point to initiate both one's self-control capability and implementation intention (Baumeister,2012; Gollwitzer,1999).

The discrepancy between distraction sources and distraction reduction intention

From the previous findings, an interesting discrepancy starts to form between the digital activities that distracted one while working and the digital activities that one wishes to reduce. In short, the most distracting digital activities are however, not the ones that people wish to reduce the most.

Although Emails and IM are the top 2 distractions for people during working as mentioned, they are the least wanted activities that one wishes to reduce. 2 interrelated reasons are behind this discrepancy: Firstly, the fear of missing out of information is a widespread feelings for participants. 7 people reported that they want to keep up with important information via Emails and IM.

Secondly, Emails and IM become digital natives' primary way of communicating and socialization. "Because this is how you social", reducing Emails and IM means reducing one's social life, just like what Yildirim and Corria (2015) categorized as the other dimensions of nomophobia, not being able to communicate and not being able to access information. However, the validity of "socializing" via virtual environment is doubtful. In fact, research suggests that the dependency on virtual environments could

be a manifest behavior of other mental disorder like social phobia (King et.al.,2013), so that one dwells in virtual worlds to avoid interacting in real-life situations.

Paradox of the increased self-rated self-control and people's actual performances

As mentioned, the average rating significantly increased from 6.25 to 7.5 (scale of 1-10), yet people's overall usage across all three digital activity categories remains the same. The common reasons for people to increase ratings are 1. "I now have a better idea about my own technology usage."; 2. "I now have a better idea about what I can do to deal with these distractions". However, no one brought up about how they are going to use these strategies or has changed their usage pattern in anyway.

Therefore, it seems that the mere exposure to self-control strategies only boosted people's perception of a higher self-control capability but didn't provide much help on the actual restrictions.

Digital distractions' destructing power on goal-setting

2 of the 3 key elements of effective self-control, standards and monitoring are largely ignored when facing the digital distractions. Study participants don't have a clear goal about how much they want to reduce the distractions but only have vague ideas and wishes to focus longer or be more mindful. Nevertheless, this kind of general goals have been repeatedly tested to have poorer performances than specific ones (Locke & Latham, 1990).

Although the monitoring system (duration) is available to keep track of digital usage, it seems that people are not conscious about such tracking. This is supported by the fact that most participants are not aware of how much time they spent off tasks before the study trial. Even after joining the study and started using a dedicated tracking system (RescueTime), two thirds of the people reported having no intention keep using it. Additionally, people tend to experience cognitive absorption, "a state of deep involvement with software" (Agarwal & Karahanna, 2000) for which the temporal dissociation is marked as a key dimension.

All of theses characteristics posites a great challenge to utilize one's self-control, and might also explain why the self-control strategies studied don't have significant effects on reducing people's non-productive activity ratio.

The combination of technological strategies and behavioral strategies

Current study findings also shed some dim light on possible ways to utilize the studied self-control strategies.

The findings suggest that Web-blockers are better suited for stressed situations like getting close to a deadline. Under stressful and tiring scenarios, people are more likely to experience ego-depletion (Baumeister, 2012), exhausting one's self-control strength. Thus, using Blocker or other access-control tools would largely help to release oneself from using extra mental efforts. The blocker is also a good choice to break people's habitual movements of visiting distracting activities, by cutting down the link between the stimulus-response pair.

As for planner, participants' responses and daily satisfaction surveys suggest that it might be better strategy to build up a good behavioral pattern and thus improve the self-control trait in a long run. As one participant commented on a Friday's daily satisfaction survey, "I plan on (actually) studying later tonight since it's Friday. Even so, I have found it easier to stop what I'm doing fairly quickly and go study, thanks to this sheet." suggesting that planner help people to wielding their internal self-control capability to stop unwanted tech-usage.

In sum, facing with the ever growing information technologies, neither of the strategies are bringing a significant effect on one's productivity. However, they are showing hope for further exploration. Technological strategies help people improve state self-control and behavioral strategies like planner might serve as a tool to strengthen one's dispositional self-control.

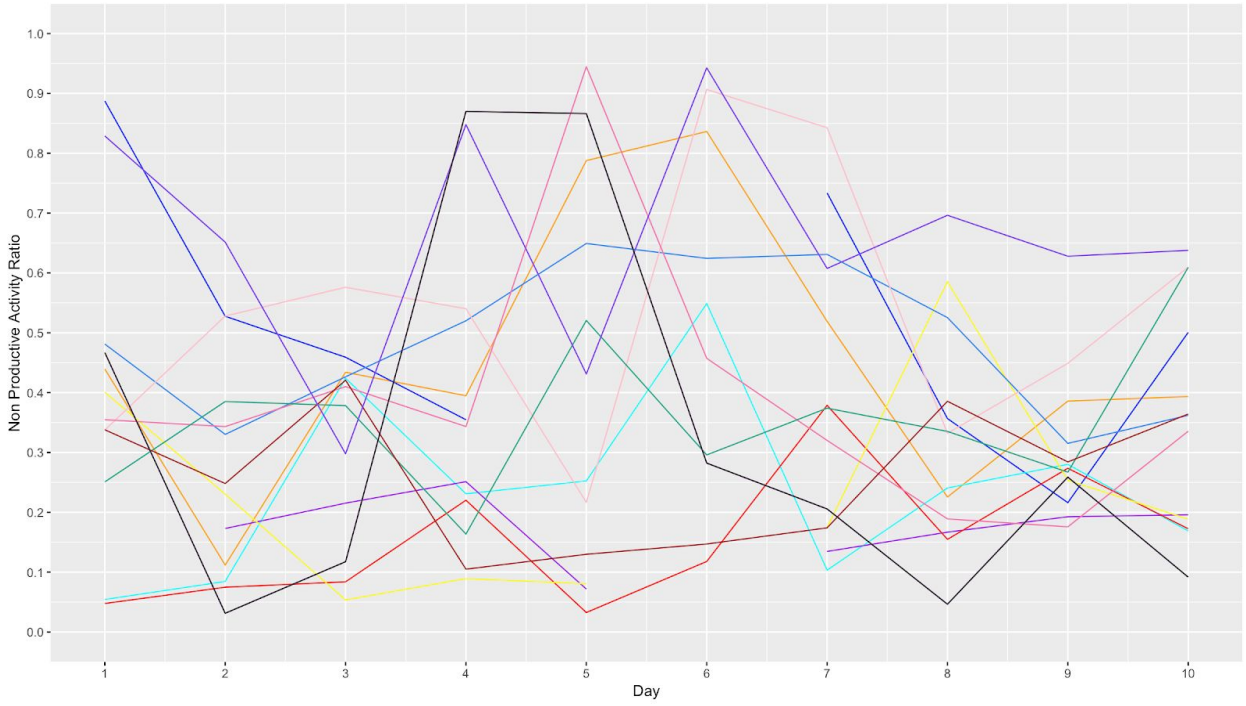
Besides, some other potentials to reduce these distractions are: replace the digital brake and relaxing activities with non-digital ones, since the cognitive absorption tends to be stronger when using entertaining activities which might cause people to forget about their previous goal of work.

Conclusion:

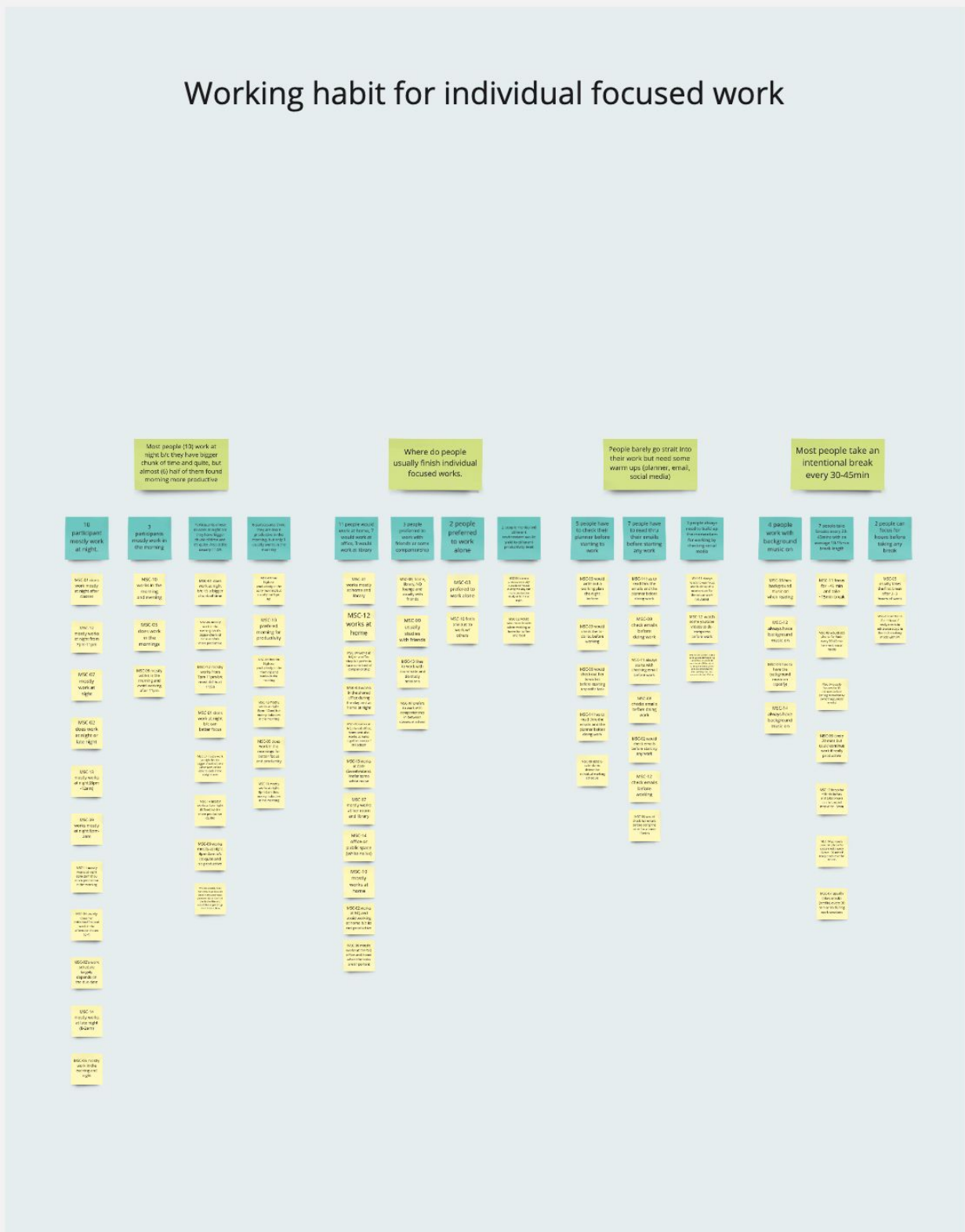
Acknowledging the reality that information technologies are greatly interwoven into our everyday life, current paper sets out to enrich our understanding about how to utilize these double-edged swords. Because of the important position that self-control holds

for individuals' personal development, 2 self-control strategies were investigated to see their effects on helping people focus on high-priority tasks on digital devices. Although no significant effects were found of the either of the strategies, they still shed much light on possible ways to promote moderage technological usage hygiene.

Appendix A: Non-productive ratio trend across 10-day period for all participants



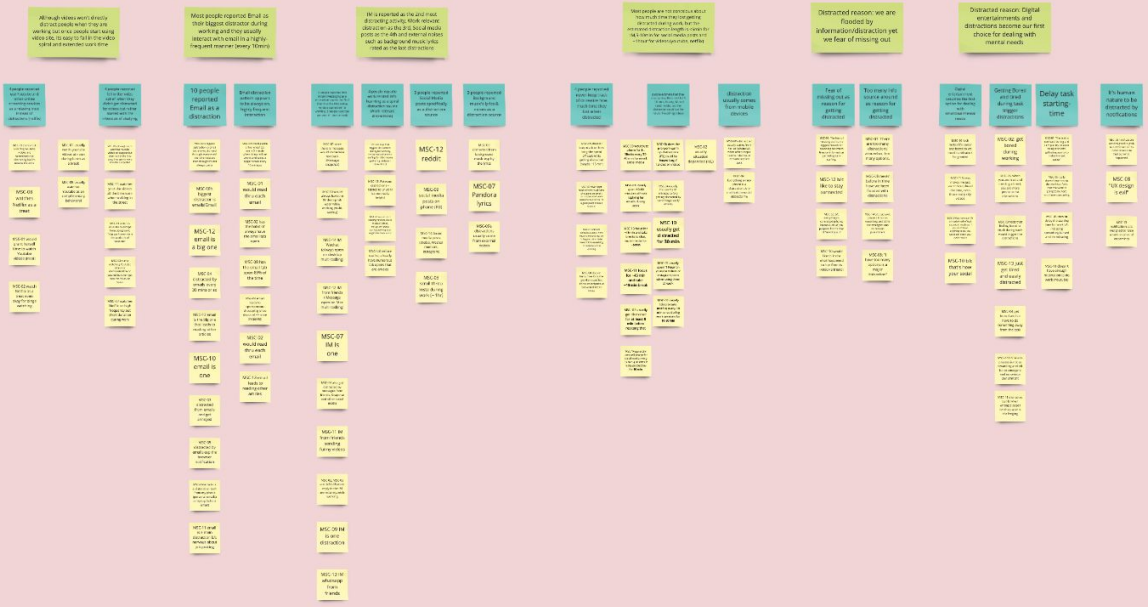
Appendix B: Affinity Analysis of interviews



Distraction source/length and distracted reason

The main distraction sources during work are : Email, IM, Work relevant info-huanting; Social media posts. Videos don't directly distract people, but once started, easily fall into a spiral

The key reasons that people are getting distracted are: 1.we are flooded w/ information and fear to miss out 2. digital activities become the first 'go-to' for dealing with majority of mental needs such as:boredom, tiredness, anxiety/stress and future comprehension



Self-control goals, strategies and current satisfaction level

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