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Improving productivity by improving cognition and focus

INTRODUCTION

In a time where time is limited, we have to use the time we have as wisely as possible. As a student with a variety of academic interests outside of school that require long times of deep focus, I noticed that I get distracted more easily the later in the day it is - the longer I have been concentrating that day. So far, I've been able to make multiple changes to my nutrition, sleep, supplementation, and general lifestyle that have helped me personally to increase deepness and duration focus. Because they have helped me a lot, this paper intends to present them to readers interested in increasing their productivity by improving their ability to concentrate.

In this paper, 'focus' will be referred to as the state of being in which an individual keeps his thoughts on one topic for a period of time. The word 'topic' here has to be interpreted in the context of the activity, which is usually not difficult to do. 'Task switching' will be defined as the repeated changing of focus between at least two topics/activities. Also, what is commonly referred to as multitasking is, in fact, also task switching, as the human brain can't focus on more than one thing at the exact same instance of time. It has been shown that task-switching reduces performance in many instances. For example, it lowers academic performance ([Bellur et al. 2015](#)), and reduces driving performance ([Drews et al. 2009](#)), among other things.

ENVIRONMENT

The most obvious factor that prevents us from focusing on an activity are things that draw one's attention to them as soon as they are noticed and therefore have us switch tasks.

Phones. Phones have become a significant part of our daily lives. However, the mere presence of phone on the desk has been shown to decrease available cognitive capacity, even in the people that "were successful at maintaining sustained attention," compared to people that had their phones not only out of their sight - i.e., also not in their pocket, but in another room (Ward et al. 2017). Furthermore, putting one's phone in another room significantly reduces the risk of taking it while working since it requires the effort to get up, walk out of the room, grab it, and walk back. This simple change may already make a great difference in increasing focus.

Cleanliness. A 2017 study found that a clean work environment, assessed by particle count and surface cleanliness, significantly correlates with a "higher perceived productivity of employees" (Horrevorts et al. 2017). This can be explained by the increase in comfortability and reduction in stress. Other ways to reduce stress will be discussed later.

Lighting. In a literature review, it was concluded that natural lighting has a significant impact on mood and performance (Shishegar 2016). It was also suggested that natural sunlight is far superior to artificial lighting "because of its dynamic quality and spectral features." These studies' immediate conclusion is that one's work desk should either be placed in a room with large windows and/or placed beside a window.

HABITS AND ROUTINES

Habits and routines are activities that one goes through repeatedly and can be performed without thinking about how to do them, like brushing your teeth in the morning. They are a powerful tool to avoid stress and to trivialize problems in such a way that one does not have to waste thoughts about them. A thorough discussion on habits and how to build them can be found in (Clear 2018). Two powerful habits will be discussed below.

Cold showers. Cold showers increase alertness and can help with getting focused in the morning. Many studies found that they can boost the function of the immune system and can decrease the likelihood of getting sick by more than 29% (Buijze et al. 2018) and may treat symptoms of depression (Shevchuk 2008).

Walking. Walking stimulates blood flow and brain function (Blasche et al. 2018), reduces cortisol (a stress hormone) levels and can improve mood (Olafsdottir 2018). A 2021 study found that walking with peers may improve this effect, although it was only tested in elderly adults $M_{age}[SD] = 77.73[6.91]$ (Kritz et al. 2021)

Schedules. Setting up a schedule might be the most powerful way to increase productivity reliably. By partitioning one's day into smaller pieces (including routines), one can use the available time as efficiently as possible. It can also help to get rid of bad habits like constantly grabbing one's phone. Because of this, scheduling can result in one having more free time for meaningful activities. ¹

There is not a lot of research establishing the average attention span of healthy adults, but it is advisable to take a 10 to 15-minute break after every 45 minutes of deep work, i.e., deeply focused work. One should keep in mind that phone usage, especially social media, should be avoided in this time, which was suggested by (Kang et al. 2019). It is more advisable to engage in low-intensity physical activity, such as walking, since this increases blood flow and brain function (Blasche et al. 2018). It is also not well established how long our brain can focus in a day, but a study conducted by the WHO (World Health Organization) found that people working more than 55 hours per week have a significantly increased risk for ischemic heart disease and strokes (Pega et al. 2016). Hence, it is advisable not to spend more than 8-9 hours six days a week on highly mentally demanding tasks.

The most significant benefit of schedules is likely their ability to minimize the effort one has to invest into thinking about trivial activities. After sticking to a schedule for a period of time, the brain adapts each of the sub-routines and habits. This also makes possibly annoying activities that one usually has to convince himself to do, like cleaning dishes, much more bearable until it becomes something one does not think about anymore. How a schedule could look like will be discussed in the last section.

PHYSICAL EXERCISE

It is undeniable that physical exercise has many positive influences on human health and performance. It was found that self-reported depression was three times lower in women who exercised almost daily than women who exercised rarely. This number was even higher for men (3.5-4.8) (Grasdalsmoen et al. 2020). Physical exercise was found to increase serotonin levels, which positively influences anxiety, happiness, and mood (Young 2007). In a 2018 literature review, it was also concluded to have a positive influence on cognition (Mandolesi 2018). In children, physical exercise is also correlated to high levels of competence, self-efficacy, and goal-oriented behavior (Biddle 2011). Therefore, implementing a regular workout routine significantly improves mental health, mood and mental sharpness.

SLEEP

In a 2003 study, it was found that chronic sleep restriction had a negative impact on cognitive functioning that progressively worsened over the 14 days. In both the 4-hour and 6-hour sleep groups, the achieved scores on cognitive tasks were significantly lower than the 8-hour sleep group (Dongen et al. 2003). While needed sleep duration is different between individuals (and even bigger between children and adults), the average adult requires somewhere between 7-9 hours of sleep every night (Hirshkowitz et al. 2015).

Improving Sleep Quality. There are multiple ways to improve sleep quality and duration. An article (Sunj 2022) by the National Sleep Foundation (NSF) lists five characteristics that should be fulfilled if one has good sleep quality: (1) falling asleep within 20 minutes of getting into bed, (2) sleeping straight through the night and not waking up more than once a night, (3) being able to sleep within the recommended time range for your age group, (4) falling back asleep within 20 minutes after waking up during the night, (5) feeling rested, restored and energized upon waking up in the morning. An example of improving sleep quality is exercise. A 2018 review found that physical exercise can significantly increase sleep quality (and duration) (Banno et al. 2018). Also, the blue light emitted by electronic devices, such as smartphones, tablets, and laptops, reduced melatonin production, a

hormone that regulates our circadian rhythm. The NSF recommends stopping using such devices at least 30 minutes before going to bed (Suni 2022).

MEDITATION AND STRESS

It is no secret that stress, especially chronic stress, hurts cognition and general health parameters. Chronic stress leads to loss of neurons, probably due to the effects glucocorticoids have on the hippocampus, a part of our brain that plays a significant role in memory and learning (McEwen et al. 1995). Brain regions such as the hippocampus, the prefrontal cortex and the amygdala are chemically affected and show changes in morphology. Mostly, these changes are reversible if the chronic stress lasts for several weeks. But it is not yet clear whether the brain's ability to recover from this is still given when the stress lasts for months or years (McEvan 2008).

Naturally, one should learn how to decrease stress levels and how to avoid stress effectively. One tool for the latter was introduced in the section "Schedules." Stress often arises when we are suddenly exposed to something that we should have done in the past but have forgotten to do or notice that we have a very small time frame to complete a task that we have not done yet. The risk for both can be significantly decreased by planning them beforehand. A way to cope with the former will be introduced in this chapter.

Meditation. Different forms of meditation have been used for thousands of years (Renger et al. 2013). It has been well established that meditation can significantly improve cognition, mental health and the function of the immune system (Vieten, 2018). In 2011, a study examined the influence of meditation of stress markers when performed before or after meditation. It consisted of 32 healthy male adults that have never practiced meditation before. It was found that meditation, either performed before or after applying a stressor, correlated with a significant decrease in galvanic skin response, electromyography, and sympathetic reactivity. When performed before the stressful activity, meditation significantly reduced the adverse effects of stress (Mohan et al. 2011). Typically, one can differentiate between nine common types of meditation, including

1. Mindfulness meditation: Letting your thoughts manifest themselves in your mind. You should not judge them but simply observe patterns that may emerge.
2. Spiritual mediation: Focusing on establishing connection to a higher power.
3. Focused mediation: Here, you focus on one specific thing, most commonly one of your senses or your breath. When you notice that your mind wanders to different thoughts, simply direct them back.
4. Progressive relaxation: Here, you focus on completely relaxing the muscles in your body. You may start at your feet and work up to your legs, torso, chest, arms, and finally neck, shoulders, and head.

To get an overview of the other types, one may look at ([Bertone, 2019](#)).

NUTRITION

There is no doubt that the right nutrition is essential for a healthy life. However, not only is it far beyond the reach of this article to establish nutrition guidelines, but, for Americans, it has already been done by ([Gov. 2020-2025](#)). Note that these generally do not only apply to people in the United States, but one should still consult a physician in case of intolerances or specific questions. This section shall only look at three specific that have been found to explicitly increase cognitive function.

Walnuts. In a 2014 study performed by UCLA, individuals in the age range 20-59 with a walnut consumption of at least 10.3g per day performed significantly better on all given cognitive tests. They had an average reaction time that was 16.4ms faster compared to those having a daily walnut consumption lower than 10.3g ([Arab et al. 2014](#)).

Berries. Berries are rich in a plant pigment called flavonoids, which are neuroprotective and have been linked to a significant increase in cognitive function. ([Spencer 2010](#)) It has also been found that total higher consumption of berries, and thus a higher consumption of anthocyanidins and total flavonoids, may significantly slow cognitive decline by up to 2.5 years ([Devore et al. 2012](#)).

Fatty fish. Like walnuts, fatty fish is extremely rich in omega-3 fatty acids. Omega-3 fatty acids, particularly also in fatty fish, have been shown to have a positive impact on blood pressure (Taheri et al. 2015) and lower the risk for impaired cognitive function (Kalmijn et al. 2004).

SUPPLEMENTS

Supplements that increase cognitive function are often informally referred to as "nootropics." Before using any of these, it is highly recommended to consult a physician to discuss proper dosages and possible side effects².

Caffeine. Caffeine is a stimulant and the most used psychoactive drug in the world. It has several positive effects on multiple aspects of human performance in moderate dosage. Most notably, these include an increase in the ability to concentrate and focus attention, the enhancement of short-term memory, an increase in the ability to solve problems requiring reasoning, a decrease in mental fatigue and enhanced physical performance. (Glade 2010). Dosages of up to 400 mg daily seem to be tolerated by most people. (Mayo Clinic Staff 2022).

Ashwaghandha. This medical herb (*Withania somnifera*) has been proven to significantly reduce anxiety and stress levels (Pratte et al. 2014). It has anti-inflammatory properties (Provino 2010) and is an antioxidant (Mishra et al. 2000). Common dosages lie between 250mg - 5g per day. It is generally well-tolerated and safe (Chandrasekhar 2012).

Alpha GPC. Acetylcholine is a neurotransmitter of the parasympathetic nervous system. It has been found that a chemical called Alpha GPC can boost the activity of the cholinergic system and upregulate the production of acetylcholine by donating choline. Its positive effects on cognition in young people come mostly from anecdotal reports. However, in a study from 1991, after 180 days of treatment of Alzheimer's patients with 400mg of Alpha GPC 3 times daily, on average, all measured cognitive markers improved. (Jesus Moreno Moreno 2003). However, it has been found that Alpha-GPC can be metabolized to trimethylamine N-oxide (TMAO) (Wang 2021), which has been linked to an increased risk

for cardiovascular disease ([Wang 2011](#)). However, in a rodent study from the year 2015, it was found that dietary allicin, which is contained in garlic, may completely prevent the production from TMAO induced by L-carnitine, which may also apply for choline. ([Wu, 2015](#)).

EXAMPLE INCORPORATION

To conclude this paper, we shall look at a schedule that takes into account the things that have been discussed. The following table consists of such a schedule, one that I have been on for a couple months.

Time	Activity	Specifications
5:00	Getting up	- Folding bed sheets
5:00-5:15	Bathroom	- brushing teeth - taking a cold shower
5:15-5:20	Supplements	- 200mg caffeine+L-Theanine - 600 mg Alpha GPC - 600 mg Ashwaghanda - Garlic
5:20-6:05	Working period	
6:05-6:15	Break	
6:15-7:00	Working Period	
7:00-7:30	Breakfast	- protein oat meal, berries, walnuts and fat free yoghurt
7:30	Getting ready for school	- packing my bag: paper, pens, laptop + cable and mouse, bottle of water
7:45	Leaving for school	- check messages before leaving
14:30-15:45	Lifting routine	
16:45-17:00	Bathroom	- Taking a shower
17:00-17:30	Dinner	- including an apple and a banana
17:30-18:30	Walk	
18:30-19:15	Working period	- checking notebook
19:15-20:30	Activity of choice	
20:30-20:40	Clean room	- if necessary: laundry, cleaning desks and surfaces - take melatonin - check phone
20:40-21:15	Reading	
21:15-21:30	Meditation	- usually progressive relaxation
21:30	Sleep	

The following things should be noted:

1. I did not include a schedule for the time when I am in school, as I cannot regulate this, and I do not have time to do anything during breaks. However, it is advisable to include tasks in such a schedule in a self-regulating job.
2. I usually do not take my phone to school and check it no more than 5 times per day.

If you have to be contactable at every point in time, I would suggest having a separate phone entirely for work and emergency contacts.

3. It is not necessary to be 100% on the minute for every activity, and you should try to avoid getting overly obsessed with it. The key is in the balance.
4. Meals also differ from day to day. But for breakfast, I have a few meal choices that I usually choose from.
5. If you are required or want to get work done on the weekend, you may want to create another schedule for the weekend.
6. It is advisable to keep the structure of your schedule the same for a prolonged period. As I mentioned in the schedule section, the most significant advantage of a schedule is its consistency, which allows you to not worry about trivial things.
7. I write down all the things that I need to do (i.e., homework, writing emails, . . .) in a notebook that I check at least once a day.
8. Sometimes I might drop one activity (the walk, for example) for something else, like spending time with family or friends.

Notes

¹ Personally, I prefer to do the heaviest work - the work that requires the deepest and longest focus - before eating in the morning, because I often experience episodes of brain fog after a meal heavy in carbohydrates and protein.

² This is especially important for pregnant women, people with physical or mental disabilities, and people with a history of cardiovascular disease. If you are unsure about the safety of any of these compounds, always consult a physician before considering taking them.

Works Cited

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This study from the UCLA linked higher peanut consumption to better cognition. On four different cognitive tests, individuals with walnut consumption of at least 10.3g per day performed better on all of them. Trustability: high, cited by 50+, published in "The Journal of Nutrition, Health & Aging", peer-reviewed.

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The findings of this review suggest that exercise can improve sleep quality without notable adverse effects in people suffering from insomnia. Trustability: high, cited by 57+, published in "PeerJ", peer-reviewed

Bellur, Saraswathi, et al. *Make It Our Time: In Class Multitaskers Have Lower Academic Performance*. *Computers in Human Behavior*, vol. 53, 2015, pp. 63–70. Crossref, <https://doi.org/10.1016/j.chb.2015.06.027>. accessed: 7.5.2022

This study examined the influence of in class mutltitasking on the GPA on college students. It was found that frequent mutlitasking, i.e. using phones for texting, reading and social media, correlated to lower than average GPA's even after controlling for study time out of class. Trustability: high, 73+ plus citations, published in peer-reviewed journal.

Bertone, Holly Cnhp J. *Which Type of Meditation Is Right for Me?* Healthline, 2 Oct. 2019, <https://www.healthline.com/health/mental-health/types-of-meditation>. accessed: 22.5.2022

This is a summary and brief description of the nine types of meditation, which are:

mindfulness meditation, spiritual meditation, focused meditation, movement meditation, mantra meditation, transcendental meditation, progressive relaxation, loving-kindness meditation and visualization meditation. It also links to further articles that describe these techniques in more detail and refers to studies that show their health benefits. Trustability: high, published on "healthline.com"

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In children, physical exercise is was found to be correlated to high levels of competence, self-efficacy, and goal oriented behavior. Trustability: high, cited by 196+, published in "International Review of Sport and Exercise Psychology", peer-reviewed

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It was concluded that physical activities and relaxation exercises in a break during a mental demanding task can enhance the breaks effectiveness compared to an unstructured rest period. It lead to an additional increase in vigor and relaxation that lasted at least 20 minutes into continuing the task. Trustability: high, 15+ citations, published in "Stress and health".

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After running a warm to cold shower protocol on 3018 participants the statistics showed a 29% decrease in sickness absence compared to the control group. A data correction can be found here: <https://doi.org/10.1371/journal.pone.0201978>.

accessed: 7.5.2022. Trustability: high, 18+ citations, peer-reviewed.

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After 60 days of 2 · 300mg per day ashwagandha administration to people with reported history of chronic stress, serum cortisol levels were substantially reduced compared to the placebo group. Only mild but never severe adverse effects were reported. Trustability: high, 88+ citations, published in "Indian Journal of Psychological Medicine".

Clear, James. *Atomic Habits: Tiny Changes, Remarkable Results : An Easy & Proven Way to Build Good Habits & Break Bad Ones*. New York, New York: Avery, an imprint of Penguin Random House, 2018. Print. accessed: 07.05.2022

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Greater intakes of straw-and blueberries, and greater intakes of anthocyanidins and total flavonoids, were linked to slower cognitive decline of up to 2.5 years.

Trustability: high, cited by 420+, published in "Annals of Neurology, vol. 72, no. 1, 2012", peer-reviewed.

Dongen, Hans P. A. van, et al. *The Cumulative Cost of Additional Wakefulness: Dose-Response Effects on Neurobehavioral Functions and Sleep Physiology From Chronic Sleep Restriction and Total Sleep Deprivation*. *Sleep*, vol. 26, no. 2, 2003,

pp. 117–26. Crossref, <https://doi.org/10.1093/sleep/26.2.117>. accessed: 17.5.2022
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This was conducted to find the impact of text messaging on driving performance. 40 participants were placed in a driving simulator and were given two tasks: in one they put their full focus on driving, while in the other task-switching between driving and texting. The data clearly showed that when task-switching, individuals were involved in more accidents and reacted slower to actions in traffic like the onset of braking lights. Trustability: high, cited by 249+, published in "Human Factors: The Journal of the Human Factors and Ergonomics Society".

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It was found that self-reported depression was 3 times lower in women that exercised almost daily in comparison to women that exercised rarely. This number

was even higher men (3.5-4.8). Trustability: high, cited by 28+, published in "BMC Psychiatry".

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This study is a summary of the recommended sleep durations and the methodology under which they were established. Trustability: high, published by the National Sleep Foundation

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When investigating the impact of workplace-cleanliness in five different organizations in the Netherlands, it was found that objective measures of cleanliness (surface cleanliness and dusk particle count) were directly correlated to higher perceived productivity. Trustability: medium, no number of citations given, 998 downloads

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The results indicate that Alpha GPC may be an effective treatment of Alzheimer's disease, as, on average, all tested markers of cognitive performance improved after 90-180 days of treatment. Trustability: high, cited by 269+, published in "Clinical Therapeutics, vol. 25, no. 1, 2003", peer-reviewed

Kalmijn, S., et al. *Dietary Intake of Fatty Acids and Fish in Relation to Cognitive Performance at Middle Age*. *Neurology*, vol. 62, no. 2, 2004, pp. 275–80. Crossref, <https://doi.org/10.1212/01.wnl.0000103860.75218.a5>. accessed: 22.5.2022

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Kang, Sanghoon, and Terri R. Kurtzberg. *Reach for Your Cell Phone at Your Own Risk: The Cognitive Costs of Media Choice for Breaks*. *Journal of Behavioral Addictions*, vol. 8, no. 3, 2019, pp. 395–403. Crossref, <https://doi.org/10.1556/2006.8.2019.21>. accessed: 7.5.2022

This study assigned 414 one of four tasks during a brain-demanding task (solving anagrams): to write down a hypothetical shopping list (1) on a phone, (2) on a computer (3) on a piece of paper with a pen in a break or (4) take no break. It was concluded that (1) is not as effective as (2) and (3) compared to (4) and did not allow that brain to recharge as effectively. Trustability: high, published in "Journal of Behavioral Addictions", peer-reviewed. *Journal of Aging and Physical Activity*

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This 414-participant study examined elderly people for 16 weeks and found that

autonomous motivation, walking self-efficacy, functional capacity, body fat, and physical activity improved when walking with peers compared to walking alone. It was also accounted for whether the participants lived alone or not. Trustability: high, published in "Journal of Aging and Physical Activity", peer-reviewed.

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This literature review summarized the safety and effects of the therapeutic usage of ashwagandha. Studies indicate that ashwagandha is anti-inflammatory, and possess antitumor, antistress, antioxidant, immunomodulatory, hemopoietic, and rejuvenating properties. Trustability: high, 180+ citations, published in "Journal of Aging and Physical Activity", peer-reviewed.

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The study examined 32 healthy male adults that have never practiced mindfulness meditation before. It was found that meditation was correlated with significant decrease in galvanic skin response, electromyography, and sympathetic reactivity. When performed before the stressful activity, meditation significantly reduced the adverse effects of stress. Trustability: high, cited by 132+, published in "The Journal of Alternative and Complementary Medicine", peer-reviewed

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