How Does Modafinil Work?

This article provides an overview of modafinil's effects on 6 neurotransmitters and their functions. We argue that **modafinil is safer than psychostimulants such as Adderall and Ritalin.**

Modafinil's Mechanism of Action (MoA)

Modafinil differs from ADHD drugs, such as Adderall and Ritalin, in terms of its mechanism of action. In fact, some have argued that the two shouldn't even be compared, since modafinil is technically not a stimulant. [1] In what follows, we will answer the question **"How does Modafinil work?"** by presenting a clear overview of **modafinil's effects on the following neurotransmitters and their functions**, based on the latest clinical research:

1. dopamine 2. serotonin 3. histamine 4. glutamate 5. GABA 6. norepinephrine.

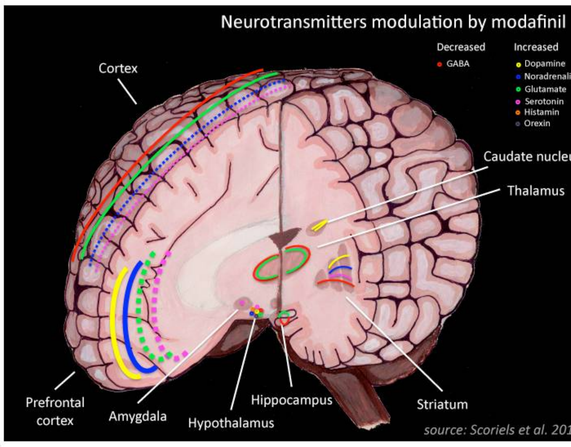
Modafinil vs. Adderall and Ritalin

First, a general note on modafinil vs. Adderall/Ritalin: **What distinguishes modafinil from stimulants such as Adderall and Ritalin (a.k.a. "psychostimulants") is that Modafinil primarily activates neural circuits in the center of the brain—specifically, the thalamus and hypothalamus—and only tangentially in the frontal lobe.** [2]

By comparison, amphetamines (e.g. Adderall) and methylphenidates (e.g. Ritalin) increase neuronal activation throughout the brain. [3] As a result, Adderall and Ritalin have a relatively high potential for dependency and abuse, while modafinil does not. [4] This is why **the USFDA classifies modafinil as a "low-risk" Schedule II drug**, while Adderall and Ritalin are considered "high-risk" Schedule IV drugs (* See note at the end of the article for more information).

Another important difference is that, **while both types of substances combat fatigue, Modafinil does so without the edginess (e.g., anxiety, stress) or 'jitters' associated with psychostimulants.** This is due to the specific combination of neurotransmitters that modafinil affects, to which we now turn.

The 6 Neurotransmitters that Modafinil Affects



1. **Dopamine: Motivation and Creativity** First on our list is dopamine. Dopamine is the neurotransmitter most associated with 'reward' and is released whenever we perform an action we perceive as being 'good' (e.g. winning the lottery or eating a cake). Therefore, it has the effective of increasing motivation. But that is not all: recent research suggests that dopamine may also aid in creative thinking. Some researchers have claimed that taking Modafinil over a prolonged period may stifle one's creativity, however a recent study [5] suggests just the opposite: increasing the availability of dopamine in the thalamus leads to higher scores on divergent thinking tests, which measure creativity and inventiveness. So it is possible that Modafinil will help you make your next big breakthrough!

2. **Serotonin: Memory and Focus** The neurotransmitter serotonin is most often associated with mood, although scientists have recently discovered that serotonin and dopamine are synergistic: they work together to improve cognition, aid in memory formation and enhance focus. On its own, serotonin is considered useful for memory due to its ability to stimulate neurogenesis (the birth of new neurons). [6] When serotonin is paired with dopamine, it produces an elucidating effect that allows for clarity of thought, concentration and enhanced learning abilities, as attested by better performance on decision-making tasks. [7], [8] So, if a better memory and heightened focus are what you are looking for, than Modafinil is what you need!
3. **Histamine: Wakefulness and Attention** Histamine is thought to be Modafinil's primary mechanism of action (MOA), as it helps to regulate the sleep-wake cycle. [9] By increasing the amount of histamine in the hypothalamus, Modafinil helps you to feel awake even if you are, in fact, tired. Higher availability of histamine may also be responsible for the attentiveness to detail that many individuals experience with Modafinil. Basically, the idea is this: if you are already awake, elevating histamine levels will only make you more alert and, therefore, more attentive to detail.

4. **Glutamate: Learning and Plasticity** Glutamate is involved in many aspects of cognitive function, though it is especially important for what is known as "long-term potentiation:" that is, the creation of associations between neurons. This makes it critical for learning and plasticity, the brain's ability to form new connections over time. [10] It is no wonder that so many college students are using Modafinil to facilitate learning and get ahead!

5. **GABA: Vigilance** A recent study showed that Modafinil reduces the amount of GABA in the "medial preoptic" and "posterior hypothalamus" areas in rats' brains. [11] GABA is known to promote relaxation, so this finding may partially account for Modafinil's ability to promote vigilance – that is, the ability to pay close attention.

6. **Norepinephrine: Wakefulness and Attention** The sixth and final neurotransmitter that Modafinil afects is norepinephrine. Norepinephrine, like histamine, plays an important role in promoting wakefulness and attention. This neurochemical is closely related to adrenaline, and so it may be elevated in response to increased activity in other parts of the brain. In other words, the brain senses that something important is going on and so it triggers norepinephrine transporters to help it wake up and pay attention.

Conclusion

In conclusion, we have seen that Modafinil works by acting on a specific set of neurotransmitters in the thalmus and hypothalamus regions of the brain to improve **attention**, enhance **creativity**, heighten **focus**, facilitate **learning**, promote the formation of **memories**, and induce **vigilance** and **wakefulness**. It's exact MOA, or mechanism of action, is technically unknown to the extent that we don't know exactly how the above neurotransmitters interact.

What we do know is that modafinil is much safer than psychostimulants like Adderall and Ritalin, since unlike these drugs, **"Modafinil is considered to have no addiction potential."** [12] As we have seen, the neurochemical processes behind modafinil are highly specialized. This means that, unlike Adderall and Ritalin, modafinil affects only specific neurotransmitters within a centralized region of the brain. The result is a cleaner, safer, and ultimately superior cognitive enhancement solution.

Buying Modafinil Online

This article is intended for educational purposes only. Research has shown that modafinil is highly effective at enhancing cognition with few to no serious side effects. Nevertheless, doctors will only prescribe it as treatment for specific conditions: namely, narcolepsy or other sleep disorders. For this reason, many students and professionals choose to purchase modafinil online. As with any supplement or drug, of course, you should consult your doctor or other health care provider before taking modafinil.

References

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* The United States Food and Drug Administration (USFDA) approved Modafinil for public use in 1998 and has classified it as a Schedule IV substance ("low potential for abuse, with low risk of dependence"), while Adderall and Ritalin remain Schedule II drugs ("high potential for abuse, with potentially severe psychological or physical dependence"). Check out the following listings on the USFDA website:

- http://www.fda.gov/downloads/drugs/drugsafety/ucm231722.pdf
- https://www.deadiversion.usdoj.gov/schedules/orangebook/c_cs_alpha.pdf