

# AI-01972 SSRI vs Cycling and Swimming

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## Explain and delve SSRI. When does humans need SSRI?

What are SSRIs?

Selective serotonin reuptake inhibitors (SSRIs) are a class of drugs that are most commonly prescribed as antidepressants. As their name suggests, they are "selective" because they primarily affect the neurotransmitter serotonin, and they "inhibit" its "reuptake," which is the process by which nerve cells reabsorb serotonin after it has been released to transmit a signal.

How do SSRIs work?

To understand how SSRIs work, it helps to know how brain cells (neurons) communicate. Neurons send messages to each other across a tiny gap called a synapse. They do this by releasing chemical messengers, or neurotransmitters, into the synapse. Serotonin is one of these neurotransmitters.

After a neurotransmitter like serotonin has carried its signal, it is typically reabsorbed by the neuron that released it. This process is called reuptake. SSRIs work by blocking, or inhibiting, this reuptake process. This means that more serotonin remains in the synaptic cleft, and for a longer period of time, which increases the amount of serotonin available to pass messages between neurons. The increased serotonin activity is thought to help improve mood, emotion, and sleep, which are often affected in conditions like depression.

It's important to note that while the increase in serotonin levels happens relatively quickly after a person starts taking an SSRI, it may take several weeks for the full therapeutic effects to be felt. This suggests that the mechanism of action is more complex than just a simple increase in serotonin levels and likely involves other changes in the brain that occur over time.

When are SSRIs prescribed?

SSRIs are a first-line treatment for a range of mental health conditions, particularly because they are generally considered safe and effective with fewer side effects compared to older classes of antidepressants. Humans may need SSRIs when they are experiencing a condition where a healthcare provider has determined that this type of medication would be beneficial.

**Common conditions for which SSRIs are prescribed include:**

- Major depressive disorder: SSRIs are most commonly used to treat moderate to severe depression.
- Anxiety disorders: This includes conditions such as generalized anxiety disorder (GAD), panic disorder, obsessive-compulsive disorder (OCD), social phobia, and post-traumatic stress disorder (PTSD).
- Other conditions: SSRIs may also be used to treat other issues like bulimia nervosa, premenstrual dysphoric disorder (PMDD), and even some forms of chronic pain or fibromyalgia.

It's crucial to understand that SSRIs are not a one-size-fits-all solution. A healthcare professional will determine if an SSRI is the right course of treatment, often in conjunction with other therapies, such as cognitive behavioral therapy (CBT).

**I'm poor and cannot afford SSRI, how can I get the same therapeutic effect naturally? Will swimming long distance or cycling or climbing Mount Everest works?**

This is a very important question, and it's understandable to feel worried about being able to afford medication. When it comes to mental health, having access to resources is crucial, and financial barriers can be a significant obstacle.

It's important to be clear: natural alternatives are not a direct replacement for SSRIs, and their effectiveness can vary greatly from person to person. The severity of a person's condition is also a major factor. For mild to moderate depression, lifestyle changes can be very effective, but for severe depression, medication and professional therapy are often necessary.

With that said, there are many natural, non-pharmacological methods that have been shown to have a positive impact on mental well-being and can be considered as part of a holistic approach to managing symptoms. These methods

work by promoting the release of feel-good chemicals in the brain, reducing stress hormones, and improving overall physical and mental health.

### **How Exercise and Other Activities Can Help**

Your question about swimming, cycling, or climbing Mount Everest is insightful because it gets to the heart of how intense physical activity can affect the brain.

- **Exercise and Neurotransmitters:** Regular physical activity, especially aerobic exercise, has been shown to increase the levels of serotonin, dopamine, and norepinephrine in the brain. These are the same neurotransmitters targeted by SSRIs.
- **The "Runner's High":** The feeling of well-being after a strenuous workout is often attributed to the release of endorphins, which are natural painkillers and mood elevators.
- **Creating New Neurons:** Regular exercise can also promote the growth of new brain cells, a process called neurogenesis, which is linked to improved mood and cognitive function.
- **Long-Term Benefits:** While a single bout of exercise can provide an immediate mood boost, the full therapeutic effects, similar to SSRIs, are often seen after several weeks of consistent activity.

So, to answer your question directly: long-distance swimming or cycling can be very effective in improving symptoms of depression and anxiety. They are a form of aerobic exercise that can provide a significant and sustained mood boost. Many people find that these types of activities are a powerful tool for managing their mental health, sometimes even reducing their need for medication.

Climbing Mount Everest, however, is a different matter. While the training and the experience itself would be physically and mentally challenging, providing a sense of purpose and accomplishment, it is not a practical or safe "treatment." In fact, some mountaineers experience "post-summit depression" after achieving such a huge goal, as the intense focus and purpose suddenly disappear. This highlights the importance of sustainable, regular habits rather than a single, monumental event.

## **Other Natural Methods and Lifestyle Changes**

In addition to exercise, there are several other evidence-based, natural methods that can help:

- **Mind-Body Practices:** Practices like yoga, tai chi, and meditation have been shown to reduce stress, improve mood, and help manage symptoms of depression and anxiety. They work by promoting mindfulness and calming the nervous system.
- **Healthy Diet:** A diet rich in whole foods, fruits, vegetables, and healthy fats (like omega-3 fatty acids found in fish) is linked to better mental health outcomes. Conversely, diets high in processed foods and sugar can be detrimental.
- **Adequate Sleep:** Sleep is essential for mental and physical health. Establishing a regular sleep schedule can help regulate mood and energy levels.
- **Social Connection:** Strong social bonds and relationships can be a protective factor against depression. Engaging with friends, family, or joining a support group can provide a sense of community and belonging.
- **Spending Time in Nature:** Exposure to nature, often called "green therapy" or "blue therapy" (for bodies of water), has been shown to reduce stress and improve mood.

### **A Note on Professional Help**

While these natural alternatives are powerful tools, they are not a substitute for professional medical advice. If you are experiencing symptoms of depression, it is crucial to consult with a healthcare professional. They can provide a proper diagnosis and help you create a comprehensive treatment plan that is right for you, which may include therapy and exploring options for affordable or free mental health services in your area. Many communities have low-cost or sliding-scale clinics that can help.

### **Explain the molecular breakdown of SSRI as it enters my mouth**

When you take an SSRI, it goes on a journey through your body, and its molecular structure is broken down and transformed along the way. This process is a key

part of how the drug works and is known as **pharmacokinetics**, which includes absorption, distribution, metabolism, and excretion.<sup>1</sup>

Here's a step-by-step breakdown of what happens at a molecular level:

## 1. In the Mouth and Esophagus: The Start of the Journey

As you swallow the pill, it's generally still in its solid, tablet form. It passes through your mouth and down your esophagus. There's no significant molecular breakdown happening here. The pill is designed to dissolve once it hits the acidic environment of the stomach.

## 2. In the Stomach: Dissolution and a Little Bit of a Change

The tablet arrives in the stomach, which is a highly acidic environment (with a pH of around 1.5 to 3.5).<sup>2</sup> The acidity helps to break down the pill's coating and a process called **dissolution** begins, where the drug's molecules start to dissolve into the stomach's fluids.

While some SSRI molecules may be absorbed directly from the stomach, this is generally not the primary site of absorption. The stomach is not an ideal place for this because of its thick mucous layer and relatively small surface area for absorption.<sup>3</sup>

## 3. In the Small Intestine: The Main Absorption Site

Once the contents of the stomach are emptied into the small intestine, the real absorption begins. The small intestine is the main site of absorption for most orally administered drugs for two key reasons:

- **Vast Surface Area:** The small intestine has an enormous surface area due to millions of tiny finger-like projections called villi and microvilli.<sup>4</sup> This provides ample space for the drug molecules to cross from the intestine into the bloodstream.
- **Neutral to Alkaline pH:** The pH of the small intestine is more neutral to alkaline (around 6-7), which is favorable for the absorption of many drugs, including SSRIs.

As the SSRI molecules are absorbed, they enter the capillaries that line the small intestine and are carried to the liver via the portal vein.<sup>5</sup>

## 4. In the Liver: First-Pass Metabolism

This is the most critical stage for the molecular breakdown of an SSRI. The liver is the body's primary metabolic organ, and it contains a family of enzymes called **cytochrome P450 (CYP450)**.<sup>6</sup> These enzymes are responsible for breaking down foreign substances, including drugs.<sup>7</sup>

This initial breakdown in the liver is called **first-pass metabolism**.<sup>8</sup> Different SSRIs are metabolized by different CYP450 enzymes.<sup>9</sup> For example:

- **Sertraline (Zoloft)** is primarily metabolized by CYP2C19, CYP3A4, and CYP2B6, among others.<sup>10</sup>
- **Fluoxetine (Prozac)** is mainly metabolized by CYP2D6.<sup>11</sup>

The CYP450 enzymes act like tiny molecular scissors, chemically modifying the SSRI molecules. This process can produce a new molecule called a **metabolite**. In the case of some SSRIs, these metabolites are also pharmacologically active. For example, when fluoxetine is broken down, it forms an active metabolite called **norfluoxetine**, which also acts as an SSRI and has a much longer half-life than the parent drug.<sup>12</sup>

This first-pass metabolism is why the dosage of an oral medication is often higher than if the same drug were administered intravenously. The liver reduces the amount of the active drug that actually makes it into the general circulation.<sup>13</sup>

## 5. In the Bloodstream: Distribution and Targeting

After first-pass metabolism, the remaining SSRI molecules (and their active metabolites) are released into the general bloodstream. They are often highly **protein-bound**, meaning they attach to proteins in the blood, like albumin.<sup>14</sup> This binding helps them travel throughout the body.

The SSRI molecules eventually cross the **blood-brain barrier** to reach the central nervous system.<sup>15</sup> This is a crucial step because their therapeutic effect occurs in the brain, where they can interact with neurons and block the reuptake of serotonin.

## 6. Elimination: The End of the Journey

Once the SSRI molecules have done their job, they are further broken down and prepared for elimination. This often involves the kidneys and the liver. The

metabolites, and some of the original drug, are excreted from the body, primarily in the urine and feces.<sup>16</sup> The time it takes for a drug to be eliminated is measured by its **half-life**—the time it takes for half of the drug to be cleared from the body.<sup>17</sup> Different SSRIs have different half-lives, which is why some are taken once a day, and others can be taken less frequently.

In summary, the molecular journey of an SSRI from your mouth to your brain is a complex process of dissolution, absorption, and metabolic transformation, with the liver playing a critical role in controlling how much of the drug becomes available to produce its therapeutic effect.