

Should the active or passive voice be used in scientific papers?

1. The change

In the 20th century, scientific texts were characterized by the passive voice, to the detriment of beautiful (and correct) English style.

At the turn of the millennium, however, a change started. The ratio of the passive in scientific texts began to decrease, approaching the “optimal” (correct) ratio. [1]

Unfortunately, many people are used to the old ways and use the passive without thinking. This is particularly typical of professionally competent but linguistically undereducated reviewers, who would expect an article to be written in the passive because they did not learn English properly and wish to force their mistakes on the writers of scientific papers. How ethical is this? [17] The vast majority of publishers and style guides for scientific papers prefer the active voice and emphasize that the active voice and passive voice should be used correctly.

Elsevier [2]:

Expunge virtually all use of the passive voice. Use of the passive voice confuses readers because it does not tell the reader "who" did the action.

Springer [5]:

Use the active voice, not the passive voice, when possible.

Elsevier and Springer do not give detailed guidelines—the passive voice is justified and correct in many cases.

Elsevier uses the APA style guide [4]:

Manuscripts should be prepared according to APA, 6th ed.,

The APA style guide states the following [8]:

When writing in APA Style, you can use the first person point of view when discussing your research steps ("I studied ...") and when referring to yourself and your co-authors ("We examined the literature ...").

It is a common misconception that foregrounding the research requires using the passive voice ("Experiments have been conducted ..."). This is inaccurate. Rather, you would use pronouns in place of "experiments" ("We conducted experiments ...").

APA style [3] does not in the least prohibit the use of "I" or "we" in scientific papers or consider it inappropriate:

We know that APA stylists prefer first person to passive voice (see APA 6th ed., sections 3.09 and 3.18). Therefore, we would say "I conducted a study" rather than "A study was conducted."

The above citations come from the 6th edition of the APA style guide. Since then the 7th edition has been published, which does not seem to contain changes affecting the language [16].

Nature [6] also prefers the active voice:

Nature journals prefer authors to write in the active voice ("we performed the experiment...") as experience has shown that readers find concepts and results to be conveyed more clearly if written directly.

Science as well [7]:

Use active voice when suitable, particularly when necessary for correct syntax (e.g., "To address this possibility, we constructed a λZap library . . .," not "To address this possibility, a λZap library was constructed . . .").

Many universities have their own guides. The guide of the University of Toronto [11] states:

Slowly, science journals are returning to a preference for the active voice, and university science departments are following suit, although they have lagged behind somewhat. Several influential science journals—Science, Nature, and the British Medical Journal, among others—are quite explicit in this preference."

University of North Carolina [12]:

Currently, the active voice is preferred in most scientific fields, even when it necessitates the use of "I" or "we." It's perfectly reasonable (and simpler) to say "We performed a two-tailed t-test" rather than to say "a two-tailed t-test was performed," or "in this paper we present results" rather than "results are presented in this paper." Nearly every current edition of scientific style guide recommends the active voice...

University of California [13]:

Unless you have a compelling reason to choose passive voice, use active voice. Consider active voice as the default and don't be afraid to use the first person when applicable.

Marc E. Tischler's Scientific Writing Booklet – University of Arizona [14]

Use the first person (I or we tested six runners) rather than the passive voice (Six runners were tested). Similarly, say Smith reported instead of reported by Smith.

There are several other guides I haven't mentioned, but most of them follow the same principles. The correct use of English is independent of profession.

2. Objective?

Some justify the excessive (and incorrect) use of the passive voice by saying that it is "objective". This is ridiculous—objectivity has nothing to do with the active or passive voice.

How much more objective is it if I write "*Tensile strength was measured*" than if I write "*I measured tensile strength*"? Does the second sentence perhaps suggest that I performed the test inaccurately, drunk, etc. just because I said I did it? Hardly.

Or consider the following sentence:

<i>The color of the samples was perceived as beautiful.</i>

It is in the passive voice, yet it is very subjective. It lacks accuracy and repeatability, as other researchers may perceive beauty differently. As professionals striving for scientific accuracy, let us insist on accuracy in English as well, not only in our own field, and let us not believe in ridiculous misconceptions.

3. How do we use it?

The form is the appropriate form of “be” + 3rd form of the main verb. However, sometimes the 3rd form alone can have a passive meaning. Examples:

Blinded by the light, he couldn't see anything.

The first half of the sentence is a passive structure, because it has the same meaning as the following sentence:

Since he was blinded by the light, he couldn't see anything.

Another example:

She repaired the vase broken the day before.

Beware! This sentence does not mean “She repaired the vase that broke the day before”! **The vase didn't break on its own!** In “full passive”:

She repaired the vase which was broken the day before.

It didn't break by itself, **someone** broke it!

Under no circumstances does the passive voice mean that something happened by itself!

You can often omit *who/which/that* + “be” (*is, was, are, were, etc.*). Examples:

*We saw a man **who was** working in the field.* = *We saw a man working in the field.*

*The book **which was** bought by Tim is a good book.* = *The book bought by Tim is a good book.*

The two constructions mean the same.

3.a. The first meaning of the passive:

The first meaning of the passive is that we don't want to reveal the “actor” for various reasons (e.g. we don't know, it's a secret, or it's clear, so mentioning it does not carry extra information).

Donald Trump was elected in 2016. (obviously he was elected by the voters)

My mother's bicycle was stolen a few years ago. (we don't know who stole it)

A mistake has been made. (Perhaps I made a mistake, but I hide behind the passive voice to avoid responsibility!)

A very important thing! Concealing who did the action with the help of the passive voice does not mean that there is no “actor”. For example, consider the following two sentences:

A hard layer formed on the surface of the metal.

It formed on its own, so it is not a passive. – As I mentioned before, what happens by itself cannot be in the passive voice!

A hard layer was formed on the surface of the metal.

This is passive voice, and it shows that this layer was definitely formed **by someone** or **something**, it certainly **did not form by itself!**

3.b. Second meaning:

The use of the passive is different when we add the “actor” with “by” at the end of the sentence to indicate who performed the action.

Hamlet was written by Shakespeare.

Why do we use the passive here?

Word order is very strict in English. We have few “legal” options to change it, but we can do it with the passive. But WHY would I want to do it? There may be several reasons for this.

The first reason is that **the end of the sentence is a place of stress** (see my guide on style).

In the sentence above, I wanted to emphasize the “actor”, Shakespeare.

Lemuel wrote an email.

This email was written by Lemuel.

In the second sentence I changed the word order with the help of the passive to emphasize the “doer”.

3.c. Dangling modifiers

The second reason is more interesting (and causes far more problems in scientific articles). This problem is called *dangling modifiers*. I have written a guide about it, too. Examples of dangling modifiers because of the incorrect use of the passive voice:

The part was injection molded using an Arburg injection molding machine.

In this case, the part used the injection molding machine. 😞

To decrease its surface roughness, the part was polished.

The part wanted to decrease its (own) surface roughness. 😞

3.d. Style

Another reason for changing the word order is that it is natural in English that known information is at the beginning of the sentence, and new information is at the end of the sentence.

Also, in good English style, long and complicated elements tend to go to the end of the sentence. I wrote about these in my guide on correct style. Bad example (the underlined subject is too long):
A composite comprising a thermoplastic matrix, and carbon fiber and also carbon nanotube reinforcement was created. 😞

4. What is emphasized?

Now let us see how stressed the “actor” is.

1. There is no actor, “the thing happened by itself”: **in this case, as I mentioned, there can be no passive, only active voice.**

A hard layer formed on the surface . (see above)

2. Here, someone definitely did it, but we do not say who. **In this case, the passive voice is correct.**

The bank has been robbed.

This may be news in a local paper.

3. *Jack the Robber escaped from prison two days ago.*

This is an interesting sentence. We know that Jack was in prison, we also know that he is a robber, so “he” is not new information. The new information should come at the end of the sentence. The new information is that Jack escaped. That is why it should be at the end of the sentence. How can this be arranged?

With **the active voice**. That is why we use it in this case.

4. *The bank was robbed by Jack the Robber.*

And finally, the police caught the bank robber whose name is the new information. How can this new information be put at the end of the sentence?

With the passive voice—in such a case that is the correct structure.

5. *How do we use it in scientific papers?*

We can therefore distinguish these four levels of stress on the “actor”.

The *Introduction*, *Abstract* and *Conclusion* sections contain the literature research (where the sources are listed by name, so **it is pointless** to use the passive to hide the name of the researchers), the essence of the research, and the summary of the scientific results. Let us see examples:

1. *A new method was developed...* (in the Abstract)

The authors used the passive because they want to hide who did the research. If they are so afraid to take responsibility for what they did, why are they putting their name on the publication at all? Everyone considers the h-index and other indexes so very important—it would be quite hypocritical to hide in the paper that the author is responsible for the new scientific results in the paper, and then they expect their h-index and others... See additional explanation in the EPL editorial [17].

By the way, the sentence can also be misunderstood! It is not clear whether the researchers in the article developed the method or other researchers in the past.

An existing and legitimate objection on the part of authors can be that they have seen many papers where, based on what I have written, the passive is used incorrectly—if those articles were allowed to be published (they were not rejected for linguistic reasons), then why do I consider it so important?

Well, because reviewers with advanced academic degrees who review articles on technical or scientific topics are **not experts in the English language (that is not what they have a degree in)** [17]. Even if they are native speakers, it is not certain that they are experts in writing (I have seen professional texts in my mother tongue written by people with degrees in various fields, and I could have cried because of their terrible style—and many grammar errors [11]. So, unfortunately, being a native speaker is no guarantee for excellent writing (good style and without errors) in English either.

On the other hand, let us think about the literature review. Here, researchers often write about the content errors they found in the articles they read, even though those articles were also published. However, these articles were written by people who are experts in their field. Well, how many more linguistic errors can there be in a paper if the author is not an expert in English?

2. *We developed a new method...* (in the Abstract)

In this case, the researchers are mentioned but not emphasized in this sentence—they are not at the end of the sentence (see my guide on style). What is emphasized at the end of the sentence is that they developed a new method. Thus, both the researchers and the research receive the emphasis they deserve.

Therefore, in this situation, only the active voice is correct English style. [8]

A few more words about the literature review. I mentioned that the active voice is correct because we know who wrote the cited studies. However, a common mistake is to “**personalize**” the study. This is anthropomorphism, which I have also written a guide on.

Avoid the so-called *non-human agent*. For example, use *the authors concluded that...* rather than *the study concluded that....* [14]

3. *A new method was developed by us.*

In this sentence, the emphasis is reversed. The research is less emphasized and researchers are more emphasized, which is not justified. This is incorrect.

Of course, the **too frequent** use of the pronouns *I* and *we* may sound awkward. So even if the active voice is correct, but the sentences are short (the next *I* or *we* would come soon), it may sound better to alternate the active voice with the passive voice (if otherwise possible), since a passive sentence between two active sentences does not cause misunderstanding as to who performed the action, as long as the sentences follow logically from each other [11].

But! Within one sentence, with the same “actor”, do not use both the active voice and the passive voice because that is bad style.

One further caution about the passive voice: we should not mix active and passive constructions in the same sentence: "The executive committee approved the new policy, and the calendar for next year's meetings was revised" should be recast as "The executive committee approved the new policy and revised the calendar for next year's meeting." [14]

4. The situation is different in the *Methods* or *Methodology* section. If well-known, regularly used measurement or test procedures, etc. are applied, the use of the passive is usually correct, because in most cases, it does not matter whether the test is performed by the researchers themselves or by a technician *if the method does not need special emphasis*. If, on the other hand, the researcher does not use well-established methods, but uses a unique test procedure or set-up that they developed, the active voice is the correct structure, because this is an individual decision that can contribute to the scientific result, so it cannot be separated from the person of the researcher. Furthermore, a unique method is important information, so it must be at the end of the sentence, and this can be achieved with the use of the active voice (see correct style). To sum it up: **When we talk about something that is part of the scientific results, the active voice is correct (with the researchers as the subject), and when we talk about routine operations used by everybody, the passive voice is appropriate.**

I will not go into the rest of scientific papers, the principles mentioned above apply elsewhere in a paper as well.

6. *Common mistakes in the use of the passive*

Unfortunately, authors often use the passive structure incorrectly. I drew attention to some mistakes above, but now I will summarize the most common mistakes made by authors of scientific papers.

1. They unnecessarily and incorrectly hide who did the action when it matters.

For example, in the Abstract:

A new method was developed to improve the mechanical properties of the polymer. 😞

The authors of the article developed the method. If they don't take responsibility for it, why do they put their name on the article [17]? Why don't they just write the name of the department, or better yet, the university, if they are so obsessed with hiding their identity with the passive?

It was found that...

Well, if the researchers and the authors of the article figured something out, then what incomprehensible nonsense is it to hide their identity? Who found it? The cleaning lady? 😊

Come on, be a little braver, the reader won't bite! And in the literature research, give a little respect to the authors of the cited articles; if they discovered something, it was not “it was found”, but the result was theirs (They found ...)!

2. It is used incorrectly for something that happened by itself.

A new material was formed as a result of the chemical reaction. 😞

The new material in this sentence was formed/formed by someone, it did not happen by itself!

3. The end of the sentence is a place of emphasis (see my guide on style!). If, as a result of the passive, the stressed information does not go to the end of the sentence, the use of the passive is almost always incorrect (quite a common problem, unfortunately).

A new method was developed. 😞 (Abstract or Conclusion)

The emphasis is not on “development”, but on “new method”. This should be at the end of the sentence, which can be achieved with the active voice.

Mathematical models that can adequately describe the bonding of amorphous and semicrystalline thermoplastics even with fiber reinforcement will be created. 😞

Well, it's not exactly "will be created" that is emphasized... 😞

4. The correct style is if the sentence begins with known information and ends with new information, that is, new information is at the end of the sentence, which is a place of emphasis. We obviously emphasize new information, not already known information. If, as a result of the passive, the new information (which we wish to emphasize) does not come at the end of the sentence, the use of the passive is almost certainly incorrect (quite a common problem, unfortunately).

A new method was developed. 😞 (In the Abstract or Conclusion)

“New method” is the new information in the sentence (this is the research result). That's not how the sentence should start... Hm. Terrible. 😞

Mathematical models that can adequately describe the bonding of amorphous and semicrystalline thermoplastics even with fiber reinforcement will be created. 😞

The new information is *mathematical models that can...* This should be at the end of the sentence, which can be achieved with the active voice.

5. In correct English style, long things come at the end of the sentence. This means that the subject of the sentence should not be unnecessarily long and overcomplicated. As a result of the passive, the subject is very often the longest element in the sentence, which is almost always utterly terrible style. I have underlined the subject in these examples.

Scanning electron microscope images of foam structures produced with different amounts of the chemical foaming agent are shown in Fig. 8. 😞

Mathematical models that can adequately describe the bonding of amorphous and semicrystalline thermoplastics even with fiber reinforcement will be created. 😞

6. In many cases, the incorrect use of the passive results in a “dangling modifier”. I also wrote a guide about this. Example:

The product was manufactured using an extruder.

Here, the product used the extruder...

So, it is not as many people think: “in scientific texts, the passive should be used”. 😊

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