

# Improving accessibility of scientific research by artificial intelligence—An example for lay abstract generation

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Boris Schmitz<sup>1,2</sup> 

## Abstract

The role of scientific research in modern society is essential for driving innovation, informing policy decisions, and shaping public opinion. However, communicating scientific findings to the general public can be challenging due to the technical and complex nature of scientific research. Lay abstracts are written summaries of scientific research that are designed to be easily understandable and provide a concise and clear overview of key findings and implications. Artificial intelligence language models have the potential to generate lay abstracts that are consistent and accurate while reducing the potential for misinterpretation or bias. This study presents examples of artificial intelligence-generated lay abstracts of recently published articles, which were produced using different currently available artificial intelligence tools. The generated abstracts were of high linguistic quality and accurately represented the findings of the original articles. Adopting lay summaries can increase the visibility, impact, and transparency of scientific research, and enhance scientists' reputation among peers, while currently, available artificial intelligence models offer solutions to produce lay abstracts. However, the coherence and accuracy of artificial intelligence language models must be validated before they can be used for this purpose without restrictions.

## Keywords

Artificial intelligence, digital, health communications, education, technology

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## Introduction

Scientific research plays a crucial role in modern society, driving innovation, informing policy decisions, and shaping public opinion. However, communicating scientific findings to the general population can be challenging, as scientific research is often highly technical and complex, requiring a deep understanding of specialized terminology and concepts. To bridge this gap and make scientific research more accessible to the general public, the concept of “lay abstracts” has been suggested as a powerful tool for communicating scientific work and findings.

Lay abstracts are written summaries of scientific research that are intended for a general audience with little or no background in the specific field.<sup>1,2</sup> They are designed to be easily understandable and should provide a concise and clear overview of the key findings and implications of the research. The concept of lay abstracts is not

new, but it has gained increasing prominence in recent years as scientists and policymakers recognize the importance of engaging the public in scientific research and promoting scientific literacy. This is also of relevance, since Open Access Publishing is driven by the idea to make scientific research more accessible in general but has not yet overcome the hurdle of making the content of research papers more understandable to lay people including patients

<sup>1</sup>Department of Rehabilitation Sciences, Faculty of Health, University of Witten/Herdecke, Witten, Germany

<sup>2</sup>DRV Clinic Königfeld, Center for Medical Rehabilitation, Ennepetal, Germany

### Corresponding author:

Boris Schmitz, Department of Rehabilitation Sciences, Faculty of Health, University of Witten/Herdecke, Holthäuser Talstrasse 2, 58256 Ennepetal, Germany.

Email: Boris.Schmitz@uni-wh.de



**Table 1.** Lay abstracts produced by three different artificial intelligence (AI)-based language models.

Example 2 and 3: Iversen et al., <sup>10</sup> Partial Oral Versus Intravenous Antibiotic Treatment of Endocarditis.
<i>ChatGPT</i>
The article discusses a study on patients with infective endocarditis on the left side of the heart. This condition is typically treated with intravenous antibiotics for up to 6 weeks, and patients require close monitoring during this time. The study looked at whether oral antibiotics could be a safe and efficient alternative to intravenous treatment for stable patients. The study enrolled 400 patients with endocarditis on the left side of the heart and randomly assigned them to receive either continued intravenous treatment or a shift to oral treatment. The study found that the two treatments had similar efficacy and safety, suggesting that oral antibiotics could be a viable alternative to intravenous treatment for certain patients.
<i>Wiseone</i>
(1) A randomized, noninferiority, multicenter trial was conducted to determine if a partial oral antibiotic treatment for endocarditis was as effective and safe as continued intravenous treatment. The study found that partial oral treatment was noninferior to intravenous treatment in terms of efficacy and safety. (2) Partial oral treatment may offer benefits such as shorter hospital stays, reduced healthcare costs, and improved quality of life for patients. (3) The article describes a randomized, noninferiority, multicenter trial that investigated whether patients with infective endocarditis on the left side of the heart could be treated with oral antibiotics once they were in stable condition, instead of continuing intravenous treatment for up to 6 weeks. The study included 400 adults, and the results showed that partial oral antibiotic treatment was noninferior to intravenous treatment in terms of efficacy and safety. These findings suggest that a shift to oral antibiotics may be a viable option for treating infective endocarditis.
<i>Copilot</i>
The paper is about a study that compared the effectiveness and safety of continuing intravenous antibiotic treatment versus switching to oral antibiotic treatment in stable patients with infective endocarditis on the left side of the heart. The study found that switching to oral antibiotics was not associated with an increased risk of mortality in non-severely ill patients. Therefore, the results suggest that a shift from intravenous to oral antibiotics may be a safe and effective treatment option for stable patients with infective endocarditis on the left side of the heart. (1) It provides evidence that switching from intravenous to oral antibiotics may be a safe and effective treatment option for stable patients with infective endocarditis on the left side of the heart. (2) It helps to reduce the burden of intravenous treatment on patients and healthcare systems. (3) It adds to the existing knowledge about the treatment of infective endocarditis and may inform future clinical practice guidelines.
Example 2: Nørgaard et al., <sup>11</sup> Effect of Treadmill Perturbation-Based Balance Training on Fall Rates in Community-Dwelling Older Adults.
<i>ChatGPT</i>
This article reports on a study which investigated the effectiveness of treadmill perturbation-based balance training (PBT) in preventing falls among older adults living in the community. PBT is an exercise modality in which individuals are exposed to external disturbances in a safe environment with the goal of improving their reactive balance control. While previous studies have shown that PBT can produce substantial improvements in reactive balance control, the evidence regarding its effects on daily-life falls is inconsistent. In this study, participants in the PBT group completed four training sessions on a treadmill, while the control group performed regular treadmill walking. The study found that while there was no significant difference in daily-life fall rates between the two groups, the PBT group had significantly lower laboratory fall rates compared to the control group at the post-training assessment, 6-month follow-up, and 12-month follow-up.
<i>Copilot</i>
The paper found that a 4-session treadmill PBT intervention did not have a significant effect on daily-life fall rates among community-dwelling older adults. However, the study found a significant reduction in laboratory fall rates. The study suggests that an 80-minute PBT intervention may lead to a statistically nonsignificant 22% reduction in daily-life fall rates. These findings may have implications for fall prevention programs for older adults and may help guide the development of future interventions
<i>Wiseone</i>
(1) Treadmill PBT did not significantly reduce daily-life fall rates in community-dwelling older adults, but did result in a significant decrease in falls in the laboratory setting. (2) PBT involves exposure to repeated external disturbances in a safe environment to

Table 1. Continued.

<p>improve reactive responses after slips and trips. (3) While PBT is considered a promising task-specific exercise modality for fall prevention, further research is needed to determine the optimal dose for retention and generalization of adaptations. A randomized clinical trial was conducted to evaluate the efficacy of a treadmill PBT intervention compared with regular treadmill walking in reducing daily-life fall rates among community-dwelling older adults. The study involved 140 participants aged 65 years or older who were able to walk without a walking aid. The results showed that the 4-session PBT intervention did not have a statistically significant effect on daily-life fall rates over a 12-month period. However, there was a significant reduction in laboratory fall rates. The study suggests the need for future research to investigate the possible effects of current treadmill PBT on daily-life falls.</p>
<p>Example 3: McInnes et al.,<sup>12</sup> Bimekizumab in patients with psoriatic arthritis, naive to biologic treatment: a randomized, double-blind, placebo-controlled, phase 3 trial (BE OPTIMAL).</p>
<p><i>ChatGPT</i></p>
<p>Psoriatic arthritis is an immune-mediated inflammatory disease affecting the joints, skin, and nails. Patients usually take conventional drugs to alleviate symptoms, but if they are not effective, biological drugs may be prescribed. Bimekizumab is a new drug that can block interleukin (IL)-17A and IL-17F, which have been linked to the disease. Recent studies found that bimekizumab was effective in treating moderate-to-severe plaque psoriasis and psoriatic arthritis, with improvements lasting up to three years. The drug has been tested in two clinical trials, which have shown that it is superior to a placebo in treating psoriatic arthritis. Patients who took bimekizumab had a greater proportion of ACR50 and ACR70 responses, indicating significant improvement in joint and skin symptoms. Patients who switched from placebo to bimekizumab also showed improvement in their responses. The drug is considered safe and well-tolerated.</p>
<p><i>CoPilot</i></p>
<p>The paper reports the results of a phase 3 clinical trial called BE OPTIMAL, which evaluated the effectiveness and safety of a drug called bimekizumab in treating psoriatic arthritis in patients who had not previously received biologic treatment. The study found that bimekizumab was more effective than placebo in reducing disease activity and improving symptoms, as well as inhibiting radiographic progression. The drug was generally well-tolerated, although Candida infections were commonly reported. The study was sponsored by UCB Pharma and registered with ClinicalTrials.gov. The practical implications of this paper are that bimekizumab may be an effective and safe treatment option for patients with psoriatic arthritis who have not previously received biologic therapy. The results of this study suggest that bimekizumab can reduce disease activity, improve symptoms, and inhibit radiographic progression. However, further research is needed to confirm these findings and to determine the long-term safety and efficacy of bimekizumab.</p>
<p><i>Wiseone</i></p>
<p>(1) Bimekizumab, a monoclonal IgG1 antibody that selectively inhibits interleukin (IL)-17A and IL-17F, has shown superior improvements in joint, skin, and radiographic efficacy outcomes at week 16 compared with placebo in patients with psoriatic arthritis who were naive to biologic DMARDs. (2) The safety profile of bimekizumab, including the occurrence of fungal infections, was consistent with previous phase 3 studies in patients with plaque psoriasis, and with IL-17A inhibitors. (3) Bimekizumab could be a potential additional treatment option with long-term, sustained efficacy and a tolerable safety profile for patients with psoriatic arthritis who do not respond to conventional or biologic DMARDs. A study published in The Lancet Rheumatology reports that a drug called bimekizumab has shown significant improvement in joint, skin, and radiographic efficacy outcomes in patients with psoriatic arthritis who were naive to biologic disease-modifying antirheumatic drugs (DMARDs). Bimekizumab is a monoclonal antibody that selectively inhibits interleukin (IL)-17A and IL-17F, which have been implicated in the pathogenesis of psoriatic arthritis. The study found that significantly more patients receiving bimekizumab reached 50% or greater improvement in American College of Rheumatology criteria at week 16 compared to those receiving a placebo, and the safety profile was consistent with previous phase 3 studies.</p>

and patients' representatives.<sup>3</sup> However, writing effective lay abstracts can be challenging.<sup>4</sup> Scientists must balance the need for accuracy and precision with the need for clarity and accessibility, and must find ways to explain complex scientific concepts in simple, easy-to-understand terms. Additionally, they must be aware of the potential for misinterpretation and ensure that their lay abstracts are clear and unambiguous. To write effective lay abstracts,

scientists must first identify the key findings and implications of their research, and then distill this information into a concise, clear, and accessible format. Use of technical jargon and complex terminology should be avoided, and instead simple, everyday language that is easily understandable by the general public should be used.<sup>1,2</sup>

Artificial intelligence (AI) is an emerging tool in multiple research areas including healthcare and has been

suggested to assist communication also with patients.<sup>5–8</sup> Using AI language models to generate lay abstracts for scientific publications has the potential to ensure consistency and accuracy in the language used to describe scientific concepts, as well as reduce the potential for misinterpretation or bias. This can be done by the researchers themselves when producing a scientific report, but also by any interested reader after publication in almost any selected language. Additionally, AI language models can be trained on vast amounts of data, making them capable of generating lay abstracts that are tailored to specific audiences or fields of research, further improving accessibility and engagement. Furthermore, the use of AI will have an immense impact on healthcare education, offering the potential to generate summaries adapted to the knowledge level of student groups enabling them to access also advanced scientific content.<sup>9</sup>

Here, examples of AI-generated lay abstracts of recently published articles are presented which were produced using currently available AI tools.

### *Using AI to generate lay abstracts*

On 1 May 2023, three recent open-access original research articles from high-impact journals were randomly selected from Pubmed.<sup>10–12</sup> Articles and addressed research topics were selected by their potential public interest including patients, and an overall interested readership. Articles were then processed using the Google Chrome (Google, USA) extensions “Copilot” (1.0.5, SciSpace, India) using the “results of the paper” and “explain practical implications” options, and “Wiseone” (0.14.0, WiseOne, France) using the summarize option, as well as ChatGPT (Mar 23 release [free version, GPT-3.5 architecture], OpenAI OpCo, USA) using the prompt “Summarize the following text for a lay person” followed by pasting the introduction, results and discussion sections of the respective publication omitting tables, figures, references, and additional information.

Generated abstracts were between 115 and 200 words in length depending on the submitted article’s complexity, which is an appropriate length for a lay abstract. All applications produced summaries of high linguistic quality (Table 1) within < 15 seconds. The user-friendliness of CoPilot and Wiseone was high since articles could be analyzed directly on the journal’s website. The free version of ChatGPT is currently limited by the maximum number of tokens that can be used per query, affecting the input and output of text, which will not allow to summarize articles that exceed a certain word limit. While ChatGPT would require some knowledge about prompts to further extract information from the submitted text, CoPilot and Wiseone offer some additional options to select from. ChatGPT would translate into common languages upon prompt, while CoPilot offers a language selection which

is missing in the current version of Wiseone. Wiseone also offers three bullet points (“key summaries”) (Table 1) which support the summary of the text. Of note, generated abstracts were accurate in terms of study findings and highly congruent with the reported findings of the original articles. CoPilot and Wiseone made use of clear and easy-to-understand sentences from the original articles’ abstracts, adding some information from the full text. ChatGPT was able to produce lay abstracts from the provided full text without access to the abstract of the original article.

### **Conclusion**

Adopting lay summaries can increase the visibility, impact, and transparency of scientific research, and enhance scientists’ reputation among peers. In the context of a changing science media landscape, lay summaries can create reliable, direct pathways between scientists and different audiences, including the general public, journalists, and decision-makers. Currently, available AI models already offer solutions to produce lay abstracts. However, it is crucial to validate the coherence and accuracy of AI-generated abstracts before their unrestricted use. Future research should focus on comparative studies, human-AI collaboration, expert evaluation, and broader user testing to ensure the reliability and credibility of AI-generated texts in the field of health research.

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**Guarantor:** BS.

**ORCID iD:** Boris Schmitz  <https://orcid.org/0000-0001-7041-7424>

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