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# Artificial intelligence and health literacy: possibilities and limitations of publicly accessible AI language models

## Summary

**Background**: With the use of artificial intelligence (AI), there is growing interest in AI systems such as ChatGPT for communicating health information. AI has the potential to improve public health literacy by serving as a source of information. At the same time, the question arises as to the possibilities and limitations of the use of AI, especially with regard to the quality and reliability of the information provided.

**Methodology**: The study is based on a literature analysis on the topic of health literacy and AI. PubMed and AI-based literature analysis programmes were used for the search (as of September 2024). A total of 136 hits were identified for 2022-2024, of which 25 articles were included in the analysis after reviewing abstracts and full texts and evaluated with regard to acceptance, information quality and barriers.

**Results**: The analysis showed that AI systems are generally able to convey health knowledge by providing easy-to-understand answers to health questions. However, there are also concerns about accuracy and the amplification of misinformation. It was emphasised that the public should be made more aware of the limitations of AI and the importance of professional advice.

**Conclusion**: ChatGPT and similar AI systems offer opportunities to improve health literacy, but require more critical media skills. Future research should increasingly focus on target group-specific and ethical aspects.

## Schlüsselwörter

Artificial intelligence, ChatGPT, health literacy, citizens, public

## Crossref/doi

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The use of artificial intelligence (AI) has become an integral part of the healthcare sector. AI is already widely used in the field of health education, e.g. with chatbots integrated into health apps (Aggarwal et al. 2023) and serves to promote health literacy. A high level of health literacy as the ability to access, understand and apply health information (WHO 2019) is crucial for making informed health decisions (Nutbeam 2008). This competence also includes being able to distinguish credible health information from misinformation in the age of digitalisation (Debad/Holmes 2024). Especially as traditional health-related information sources (e.g. medical staff, TV, printed and online media) are supplemented by AI-based information services such as ChatGPT. ChatGPT was first made publicly available by OpenAI in November 2022 and quickly became very popular (especially among younger age groups) (Kasneci 2024). The extent to which such tools influence citizens' health literacy remains to be seen. It is also unclear to what extent access to health information is made easier compared to traditional internet research ('Dr Google') and what new challenges arise with regard to the quality and interpretation of this information.

>> A high level of health literacy enables individuals to participate in decision-making processes together with healthcare providers and thus gain more control over their own health (Caeiros et al. 2024). High health literacy is associated with better health outcomes and reduced inequalities as individuals equip themselves with knowledge to manage chronic conditions and navigate the healthcare system (Caeiros et al. 2024). It can be a resource against unfavourable social conditions and promote more equitable access to healthcare (Zanobini et al. 2024). Despite the importance of health literacy, many people encounter barriers that make it difficult for them to achieve sufficient health literacy. These include limited access to reliable information and insufficient media skills to deal with the flood of digital information. On the one hand, AI-based language models (e.g. ChatGPT) enable them to quickly access extensive health information and thus understand complex issues; on the other hand, inaccurate or incorrect answers (so-called hallucinations) can occur (Vij et al. 2024). There are also initial indications that although ChatGPT provides users with different demographic profiles with the same information, this is formulated differently in terms of language (Andreadis et al. 2024), which could lead to different interpretations of the AI responses.

In terms of public perception of AI in healthcare, one study found that over 90% of respondents had already heard or read about AI, but only 24% had good or very good knowledge in this area. In general, around half (53.18%) of respondents rated the use of AI in medicine as positive or very positive, while only 4.77% had a negative or very negative attitude. Despite the lack of major concerns, the majority felt that the new technology should only be used under medical supervision. Older patients, women and people with a lower level of education and low technical affinity were particularly cautious (Fritsch et al. 2022).

It is striking that research to date has been strongly limited to the area of AI-based education of healthcare professionals and academic education. Research findings in the area of health literacy of the population via AI have so far been rare. Therefore, this article deals with the possibilities and limitations of freely accessible AI-based language models (so-called Large Language Models, LLM for short) for the promotion of health literacy in the general population using the example of ChatGPT.

Three objectives are being pursued: Firstly, to identify the potentials and limitations of AI systems in the provision of health-related information. Secondly, a critical reflection on the trustworthiness and influence of AI-supported information on the health literacy of users and thirdly, recommendations for action to strengthen digital health literacy through the responsible use of AI technologies will be derived on the basis of the findings.

## Methodology

To investigate the research topic, a narrative literature analysis was conducted in September 2024 to obtain an overview of the topic. For reasons of topicality, the period of the analysis was limited to the years 2022 to 2024. Traditional literature databases (Pubmed) and AI-based literature analysis programmes (Consensus, ResearchRabbit, typeset_io) were used for the analysis. The keywords searched for were 'artificial intelligence' and 'health literacy'. Of 136 identified sources, 25 sources were finally included in the analysis after screening (abstracts, full text) (Fig. 1).

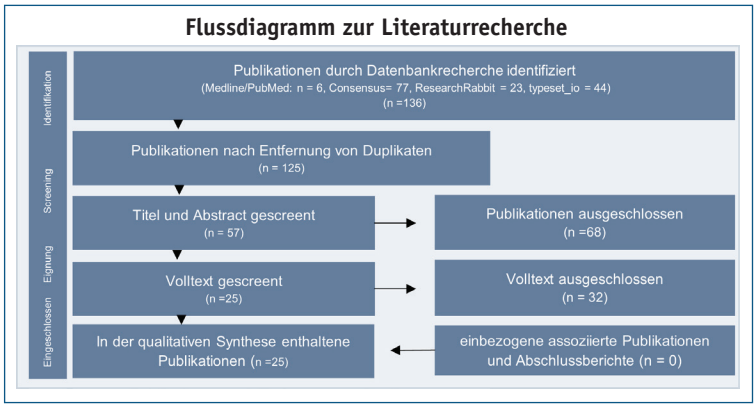



***Abb. 1:*** Flussdiagramm zur Literaturrecherche (Vorlage PRISMA-Statement nach Moher et al. 2009). Quelle: eigene Darstellung.

The use of traditional literature databases and AI-based literature analysis tools was also intended to reflect the added value that a combination of both approaches can bring to scientific research. It was found that although the majority of exclusions came from the AI-supported literature search, the overall yield of this search could be significantly increased (14 typeset_io, 9 consensus, 2 PubMed). This finding is in line with current studies on the topic of AI literature searches, which also emphasise that, on the one hand, effectiveness can be increased by AI-supported automation in literature search processes, but on the other hand, critical review of the data material by the researchers is essential. AI-generated literature analyses are particularly suitable for large amounts of data and interdisciplinary research topics (Ejjami 2024, Tomczyk et al. 2024). As shown in Fig. 2, publications focussing on the quality assessment (content validation, fact verification and consistency check) of AI-generated content represent by far the majority of the identified sources.

The analysis was based on the following evaluation criteria, which were specified on the basis of theoretical considerations and discussion with the authors:

1. acceptance: acceptance refers to trust as well as the willingness to use ChatGPT, whereby target group-specific differences (age, class, etc.) were taken into account, as these determine whether and how (critically) AI-based tools are used.
2. quality: The quality and comprehensibility of the AI information provided are relevant for (perceived) reliability, acceptance and health literacy.
3. barriers: Barriers including data protection aspects relate to access and trust towards AI-based tools and in turn influence acceptance and effectiveness.

## Results

**1. acceptance and trust**

Only a few studies (7 out of 25) addressed the topic of acceptance and trust. Overall, the public tends to trust doctors more than AI technology and is more likely to follow their recommendations than those of an AI, even if they have cultural biases. When it comes to the question of whether a doctor should use AI, the public is almost equally in favour or against. There is unease about AI being informed about health status, both in the present and in the future (Rojahn et al. 2023). In addition, especially when users feel overwhelmed, discomfort is reported due to the complexity and lack of control (Chalutz-Ben Gal 2023). On the other hand, AI responses are sometimes categorised as more empathetic (Ayers et al. 2023b), although these could exacerbate existing problems.

In particular, the abundance of deficient information or AI outputs could unsettle patients with socio-economic and cultural resources, especially as they tend to shy away from interactions with healthcare professionals anyway. For patients with high resources, easy access to health information can increase anxiety about making the 'right' decision (Lautrup et al. 2023). The feeling of being respected, a positive attitude, the expected benefits, ease of use, recommendations from third parties and existing resources (media skills, etc.) influence the frequency of use (Li et al. 2023; Budler et al. 2023). Women are less convinced of the health benefits of ChatGPT than men. People with a higher level of education and those who have already heard of ChatGPT also tend to rate the health benefits as low. Health literacy and affinity for technology have no significant influence on the expected benefits (Platt et al. 2024). However, tech-savvy and open-minded people tend to use AI-based applications more frequently (Ben-Gal 2023).

**2. Quality and comprehensibility**

Of the 25 publications included, 19 dealt with the quality or comprehensibility of information generated by artificial intelligence. Of these, two articles were literature reviews, while the remaining 17 articles contained studies conducted specifically for this purpose. All studies dealt with LLMs, mostly ChatGPT in the respective available versions in English. The studies either simulated a question-and-answer format or asked the LLM to provide educational information or improve its comprehensibility. Regarding the accuracy of the information, most studies concluded that the LLMs provided mostly correct information, but that it was mostly generic and had gaps in content (Budler et al. 2023; Grünebaum et al. 2023; Hillmann et al. 2024; Karakas et al. 2023; Kassab et al. 2024; Sciberras et al. 2024; Walker et al. 2023). Nevertheless, the information from LLMs was sometimes more correct than that from doctors (Ayers et al. 2023a) and more relevant, albeit more incomplete than the internet search (Pascual-Presa et al. 2024). More advanced LLMs (e.g. ChatGPT 4.0 compared to ChatGPT 3.5) showed higher accuracy compared to previous versions (Wang et al. 2023; Washif et al. 2023). The quality of the prompting partly

affected the quality of the responses (Deiana et al. 2023; Lautrup et al. 2023). In addition, there was rarely so-called 'actionable' information, i.e. recommendations on behaviour or on seeking out certain offers (Anaya et al. 2024; Ayers et al. 2023b). The comprehensibility was partly described as mixed or limited (Ghanem et al. 2024; Mondal et al. 2023), unless it was directly prompted that the information should be easy to understand (Abreu et al. 2024; Rouhi et al. 2024). In addition, LLM responses are probabilistic, i.e. they are based on probabilities to generate the most relevant answer. The response quality therefore varies from case to case (Ayers et al. 2023).

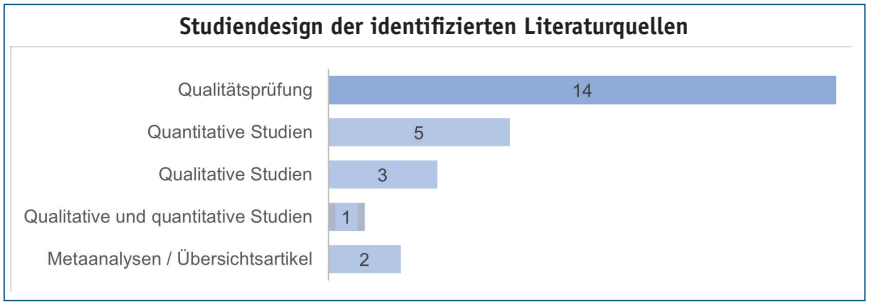



***Abb. 2:*** Studiendesign der identifizierten Literaturquellen (N=25) Quelle: eigene Darstellung.

**3. Barriers, data protection and data security**

Data protection and data security are only addressed in a few studies. Barriers can arise due to disadvantages of certain subpopulations. According to Karakas et al. (2023), although no personal data is stored or retrieved in ChatGPT, no personal health data should be entered during the interaction. Concerns about data protection and the willingness to provide personal information also play a role in the willingness to use AI (Chalutz-Ben Gal 2023; Platt et al. 2024). A facilitating factor for the use of AI can be the feeling of privacy and being respected (Li et al. 2023). Ethnic minority membership was associated with positive expectations of ChatGPT as a healthcare resource in a study by Platt et al. (2024), and in the study by Rojahn et al. (2024), respondents believed that AI could make less culturally biased decisions than human interaction partners. Few studies examine the role of gender as an access factor. Washif et al. (2023) observed that strength training programmes for women generated via ChatGPT were more likely to be tailored to men. As described under 1., female gender and higher education levels are associated with more reservations about the use of AI as a health resource and can thus also represent a barrier to the use of AI. An expected high usage effort and resentment towards AI also proved to be barriers to the use of chatbots for health issues (Li et al. 2023).

## Discussion and limitations

Acceptance and trust appear to be strongly dependent on personal characteristics (e.g. age, gender, affinity for technology), ethical factors (e.g. privacy, data protection) and technological factors (e.g. user-friendliness, type and quality of output). The quality of the output depends heavily on user input and often appears to be correct, but also incomplete. It should be noted that readability is often tested in English in quality tests, which calls into question the transferability of the results to a German environment. Findings on comprehensibility vary greatly. How different user groups interpret and possibly implement AI outputs currently remains an open question. Ethical aspects (e.g. data protection, data security, privacy) are currently given little consideration (depending on the target group). The tendency identified in several studies for AI to formulate health information at a high level of education can also contribute to increasing social inequalities in terms of health opportunities and be considered an ethical challenge. In addition, a further ethical issue arises: if advanced large language models, which are often paid models, provide better information, access to this improved content is restricted or only accessible to people with paid models. Conversely, AI could improve the access of minorities to health information due to the low-threshold offer and the perceived cultural impartiality. In terms of methodology, a key limitation is the small number of qualitative and quantitative studies with rather small samples. This is due to the fact that AI is still a relatively new instrument and quantitative studies in particular take a long time to complete (Castillo-Martínez et al. 2024). The comparability and interpretation of the studies is made more difficult by the fact that the study design, study duration, population groups and object of investigation differ greatly. There is also a lack of longitudinal studies (Platt et al. 2024), which poses a major challenge in view of the rapid development of AI and leads to distortions. Given the complexity of LLMs, more qualitative and quantitative studies are needed to better understand the underlying attitudes of people With regard to AI as a literature analysis tool, it should be noted that the results are only reproducible to a limited extent, as AI technology is constantly evolving and the use of different AI tools requires a certain level of understanding. Although the efficiency, accuracy and inclusivity of the literature search process is increased (Ejjami 2024), the high number of irrelevant results shows the need to review AI results (Fig. 1). It can be an enrichment for the extraction of sources, but 'hallucinations' also occur here when interpreting data (AI summaries), so extremely careful source verification is essential.

Conclusion

To summarise, AI systems can help the public to receive health information in an understandable form. This can help to promote health awareness, reduce the risk and spread of e.g. infectious diseases (e.g. Covid-19), reduce psychological pressure and anxiety and thus promote an optimistic attitude (Wang et al. 2023). However, it should be borne in mind that health inequalities may be exacerbated, as digital health literacy (prompting skills, critical handling of digital information) is less pronounced, especially among educationally disadvantaged groups, and it is to be expected that a healthy user effect will occur analogue to health apps, for example, and that target groups that already have a high level of health awareness are more likely to benefit from AI advantages. Overall, the findings also point to a need for action in

## Literature


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medical care (keyword empathy, discrimination) and to the need for greater education of the public and healthcare stakeholders, as AI-based research (on the part of the public and researchers) requires a thorough review process and appropriate skills to ensure responsible use of AI tools. Future studies should take greater account of target group-specific and ethical aspects and be designed as longitudinal studies in order to better capture long-term effects between different population groups. <<

## Artificial intelligence and health literacy: possibilities and limitations of publicly available AI language models

**Background:** With the use of artificial intelligence (AI), interest in AI systems such as ChatGPT for communicating health information is growing. AI has the potential to improve public health literacy by serving as a by serving as a source of information. At the same time, the question arises as to the possibilities and limitations of the use of AI, especially with regard to the quality and reliability of the information provided.

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**Conclusion:** ChatGPT and similar AI systems offer opportunities to improve health literacy, but require more critical media skills. In future, research should increasingly focus on target group-specific and ethical aspects.



## Keywords

Artificial intelligence, ChatGPT, health literacy, citizens, public,


## Authors' declaration

The authors declare that there are no conflicts of interest.


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