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ORIGINAL RESEARCH

Artificial intelligence-generated podcasts open new doors to make science accessible: a mixed-method evaluation of quality and the potential for science communication

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Aims

Science podcasts have proved to be valuable mediums for medical education and science dissemination. Tools adopting rapidly evolving technologies such as generative artificial intelligence (GenAI) now enable us to create podcasts in a matter of minutes (e.g. NotebookLM, Jellypod). However, GenAI entails challenges, such as hallucinations, which could compromise the trustworthiness of generated content. Therefore, this study aimed to explore the quality of AI-generated podcasts and their potential for science communication.

Methods and results

We conducted a mixed-method evaluation of 10 AI-generated podcasts for articles published in *the European Journal of Cardiovascular Nursing.* Participants were asked to complete a questionnaire and were invited for a video interview. They were not informed of the AI-nature of the podcast prior to evaluation. Only half of them were able to identify this aspect. The fact that the podcast was able to summarize key findings in an easily understandable and engaging manner was found to be a great asset. However, participants also indicated that the American style of the podcast took away from its credibility. Moreover, some podcasts contained inaccuracies, incorrect use of medical terms and mispronunciations, thereby compromising trustworthiness. Podcasts were found to be most appropriate for patients and the public but could be useful for researchers and healthcare professionals as well if they were tailored accordingly. Rigorous evaluation and transparency about the AI-generated nature of the podcast, referencing the original article and author acknowledgement were recommended.

Conclusion

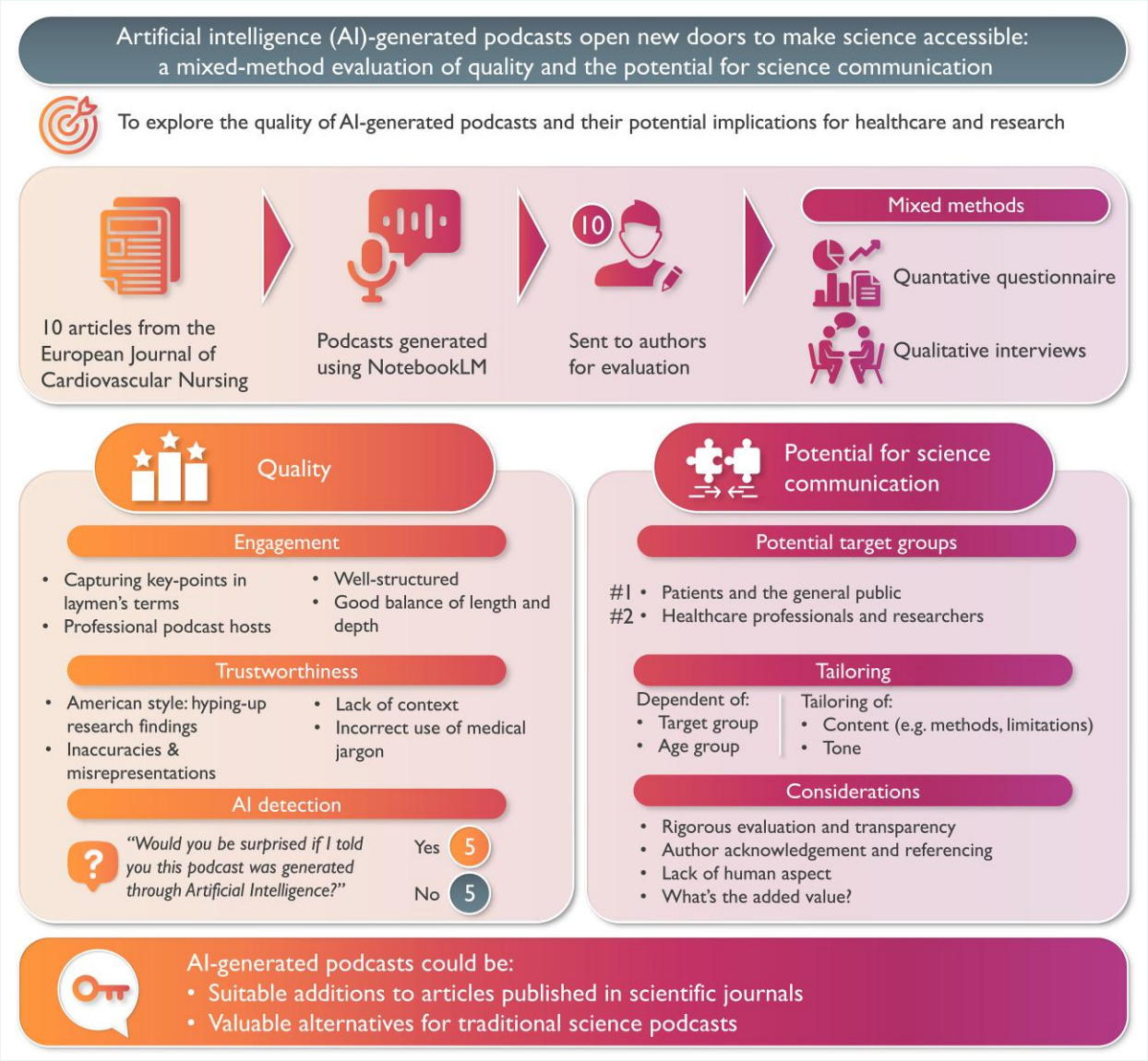
AI-generated podcasts could be relevant additions to scientific journal articles and valuable alternatives for traditional science podcasts.

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Graphical Abstract

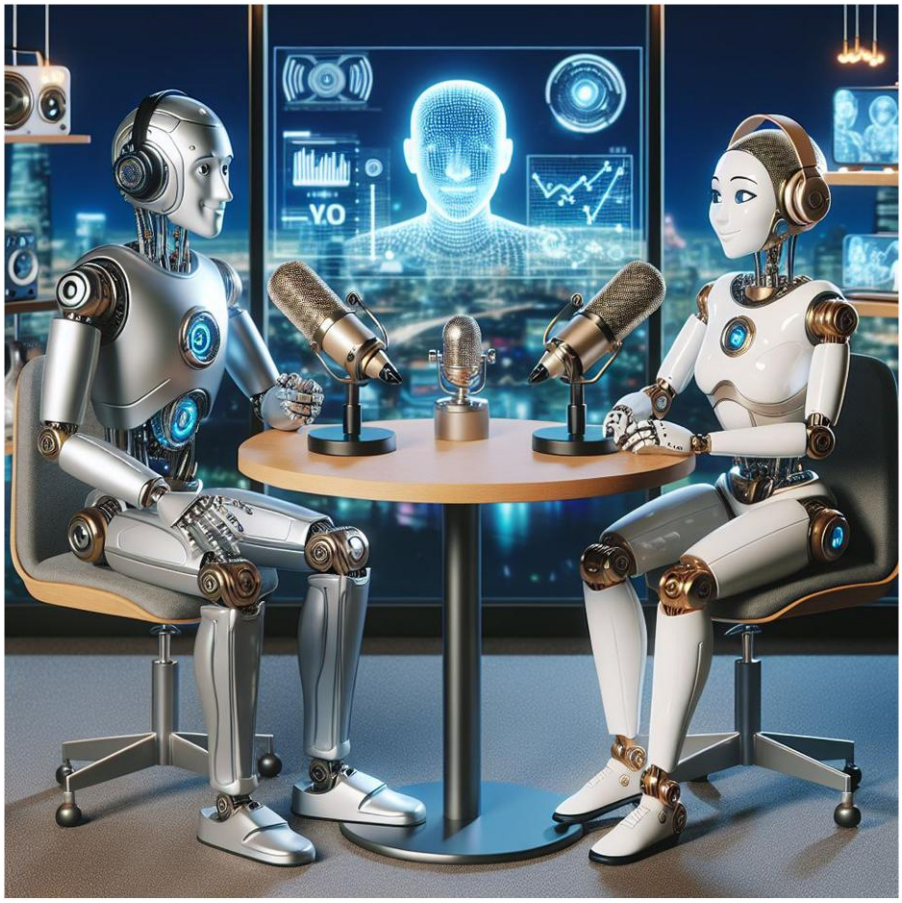


Keywords Accessible science • AI • Artificial Intelligence • NotebookLM • Podcasts • Science communication • Science dissemination

Novelty

- This is the first study that evaluated artificial intelligence (AI)-generated podcasts on articles published in a scientific journal.
- Artificial intelligence-generated podcasts are able to summarize key-findings in an easily understandable and engaging manner.
- Podcasts are suitable for science communication, mainly to patients and the public, but could be useful for researchers and healthcare professionals as well.

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Audio 1 AI-generated podcast on the present article. Note: This image is generated using Microsoft Co-Pilot. An AI-generated podcast based on the following article is made and can be accessed here (*Audio 1*).

Introduction

In recent years, the number of science podcast series has significantly increased.[1] Since then, podcasts have continuously proved their value for science dissemination and medical education. Not only they are found to be equally as effective as traditional education material in terms of knowledge retention,[2] they also increase understanding on specific scientific topics in diverse listening audiences.[3] Podcasts are '*a piece of episodical, downloadable or streamable, primarily spoken audio content, distributed via the internet, playable anywhere, at any time, produced by anyone who so wishes*'.[4] Since technological evolutions have defined and will continue to define podcast features, the definition of podcasts will further evolve over time.

Although constantly evolving, some features are essential for recent podcast successes. First, podcasts offer the advantage of flexibility: they can be listened to at any given place or time, making them convenient tools for on-the-go listening and multi-tasking.[1,2,4,5] Second, they provide listeners autonomy by giving them the power to pause, rewind or fast forward audio whenever necessary.[2] Third, most podcasts are freely available on streaming platforms, including Spotify and Apple podcasts. Meanwhile, other scientific information sources, such as books, academic journal articles, and conferences are often behind a paywall.[6,7] This adds to the accessibility of scientific podcast content for anyone interested.

Owing to these benefits, academic journals have started developing their own podcast series. The *British Medical Journal (BMJ)* and the *Journal of the American Medical Association* (*JAMA*) released their first podcast almost two decades ago (2006 and 2008, respectively) and, from then, have developed a variety of podcast series for different medical domains and topics.[8,9]

Despite demonstrated benefits, creating a podcast series and regularly releasing new episodes requires substantial time, effort, and resources.[1,7,10] Finding a way to generate scientific podcasts more efficiently, while also maintaining quality and trustworthiness, is critical to make podcasts sustainable. Recently, considerable advancements have been made in the domain of generative artificial intelligence (GenAI), a subset of artificial intelligence (AI) trained on a large amount of data to generate content such as text and images but also video and audio.[11,12] The adoption of GenAI to improve healthcare systems has increasingly been studied. It has, for instance, been shown valuable for rapidly accessing information and effectively summarizing medical articles. However, challenges have emerged as well, some of which could significantly affect the trustworthiness of the generated content. In the context of AI-generated podcasts, the output of inaccurate or made-up information, commonly referred to as hallucinations, should be considered a potential pitfall.[13] Accordingly, GenAI should comply with ethical requirements such as transparency, accountability, and fairness, as described in the Ethics Guideline for Trustworthy AI put forward by the European Commission.[14]

Since tools for AI-podcast generation are relatively new, AI-generated podcasts have only been evaluated in two studies, focusing on medical and nursing students. We hypothesize that AI-generated podcasts could leverage the uptake and dissemination of scientific research in a variety of target groups. Therefore, this research aimed to explore the quality of

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AI-generated podcasts and their potential for science communication. We thereby seek to answer the following research questions: (i) How do authors of scientific journal articles perceive the quality of AI-generated podcasts in terms of engagement and trustworthiness? (ii) What are potential target groups for science dissemination through AI-generated podcasts?

Methods

Participants and procedure

We conducted a mixed-methods study, combining a questionnaire- and interview-based survey to evaluate 10 AI-generated podcasts on articles published in the *European Journal of Cardiovascular Nursing* (EJCN). We purposively selected papers to include a range of article types, i.e. five original articles,[15–19] two reviews,[20,21] one patient perspective,[22] one methods corner,[23] and one discussion paper.[24] Publication topic was not a selection criterion. We selected the most recent publications from authors that (i) have previously collaborated in initiatives or evaluations by the journal, (ii) would be readily available, and (iii) willing to participate in our study. The corresponding authors of the 10 selected articles were contacted by e-mail and asked for their willingness to participate in this study, each of which agreed and provided informed consent. Participants were based in Europe ($n = 6$), the USA ($n = 2$), Australia ($n = 1$), and Canada ($n = 1$). One author had conducted studies on AI in healthcare settings prior to participation, and one other author has participated in prior AI evaluations in nursing research. To ensure a non-biased evaluation, participants were not informed that the podcast would be generated with AI.

The questionnaire (see Supplementary material online, *S1*) and interview guide (see Supplementary material online, *S2*) were developed by exploring and adapting suggestions generated by ChatGPT (see Supplementary material online, *S3*). The questionnaire was created in Microsoft Forms and consisted of 11 multiple-choice questions and the option to elaborate on certain responses (see Supplementary material online, *S1*), providing an initial insight to the perceived podcast quality. Questionnaire results were then used to develop a semi-structured interview guide, consisting of two parts. The first part encouraged participants to elaborate on their responses to the questionnaire. The second part pertained to the AI aspect of the podcast. We asked participants: '*Would you be surprised if I told you that this podcast was generated through Artificial Intelligence?*', followed by an exploration of concerns and potential for science communication (see Supplementary material online, *S2*).

Three days before the interview with the researcher (C.D.) was scheduled, participants received the link to the podcast and the questionnaire by e-mail. The interviews were conducted via Microsoft Teams and lasted ~30 min. Interview discussions were recorded and simultaneously transcribed through intelligent speech recognition via Microsoft Teams, as illustrated by Eftekhari.[25] Recordings and transcripts were stored in a protected environment. Transcription accuracy was checked against the recordings by the interviewer.

Software: NotebookLM

NotebookLM (July 2023) is a personalized AI research assistant created by Google Labs.[26,27] It differentiates itself from other tools by connecting generated output to specific data sources (source-grounding). This is said to reduce the number of hallucinations and therefore increase trustworthiness.[27,28]

In September 2024, a new Audio Overview feature was introduced to NotebookLM, enabling users to turn their sources into podcasts that summarize and discuss content.[29] As from October 2024 users can also 'prompt' their podcasts by providing certain instructions pertaining to the focus of the podcast, the intended target audience, and more.[30] With this input, a downloadable audio file is generated. Users can either decide to keep the podcast or delete it and try again till it fits their expectations.

In the present study, a podcast was created for each article by uploading the full article in NotebookLM. Then, we used the 'Audio Overview' section to generate a 'Deep Dive Conversation' with no additional prompts, which was downloaded as WAV file and reviewed by one of the researchers (P.M.). Eight podcasts were deemed acceptable at first try. The remaining two were either too long or cut-off in the middle of the podcast. For these articles, we generated a second audio file while prompting to limit the podcast to 7 min or targeting more to cardiovascular nurses. Note however, that the prompting possibilities in NotebookLM at that moment were very limited.

Data analysis

Quantitative results were analysed and expressed in absolute numbers, given the small sample. The interviewer (C.D.) used manual thematic coding while iteratively reading transcripts and immersing in the data to identify recurring themes. The identified themes were assessed and approved by the second researcher. Quantitative results were merged within the qualitative analysis, resulting in a narrative description (see '*Results*') and graphic summaries (see *Figures 1–6*).

Results

Quality

The quality of the podcasts was assessed in terms of: (i) engagement, (ii) trustworthiness, and (iii) AI detection.

Engagement

Participants' first impression of the podcast mainly pertained to its ability to capture the key elements of the article in '*very simple, easy to understand terms*' (P2), thereby increasing its accessibility to the lay audience (*Figure 1*). The structure of the podcast added on to this: '*it started with the actual content and then some examples*' (P6).

A second aspect that stood out was the interactivity of the podcast hosts. They presented information in a conversation-like way while showing interest in the research topic, which made participants feel '*pulled into the conversation*' (P10). Some even assumed that the speakers were professional podcast hosts with a background in '*either nursing or medicine*' (P3).

With podcast lengths ranging between 5 and 17 min (Mean: 10 min; SD: 3 min), all researchers but one agreed that the podcast had an appropriate length and depth, as well as a pace that allows people to stay engaged. This one author found that relevant information was presented during the first 80% of the podcast, while for the remaining 20% '*it started to feel like a bit of a filler*' (P10) (*Figure 1*).

Trustworthiness

Most participants considered the podcast to be a reliable source of information compared with the research itself (*Figure 2*). Nonetheless, some recurring factors were identified that could undermine the podcasts' trustworthiness.

One of the initial things that had struck participants was the American style of the podcast. As the podcast was an initiative of the *EJCN*, participants were surprised to hear American voices, which took them some time to get used to. In that light, quite a few researchers found that certain aspects and findings of the study were hyped up unnecessarily by repeatedly using words as '*amazing*', '*totally*', '*exactly*', and '*groundbreaking*', resulting in a lack of nuance. Hence, some participants would have appreciated a more academic tone to the podcast.

Another aspect that impacted the credibility of the podcast was the fact that the podcast hosts did not introduce themselves, nor their expertise or the name of the podcast series. This lack of context made one author feel '*a bit lost*' (P7).

Furthermore, half of the participants had noticed inaccuracies or misrepresentations in their podcast. Some were related to the aim of the study or the study sample. For example, in one podcast, the hosts talked about the diagnosis of heart failure, while the actual study did not pertain to the diagnosis, but rather to the management of patients with heart failure. In another podcast, study participants were continuously referred to as 'these women', even though the sample included a small number of men as well.

Although seven participants indicated that the scientific terminology was used in a correct and consistent way, other participants found incorrect information. In one case, patient empowerment was referred to as '*patients following treatments*', while the author explained that

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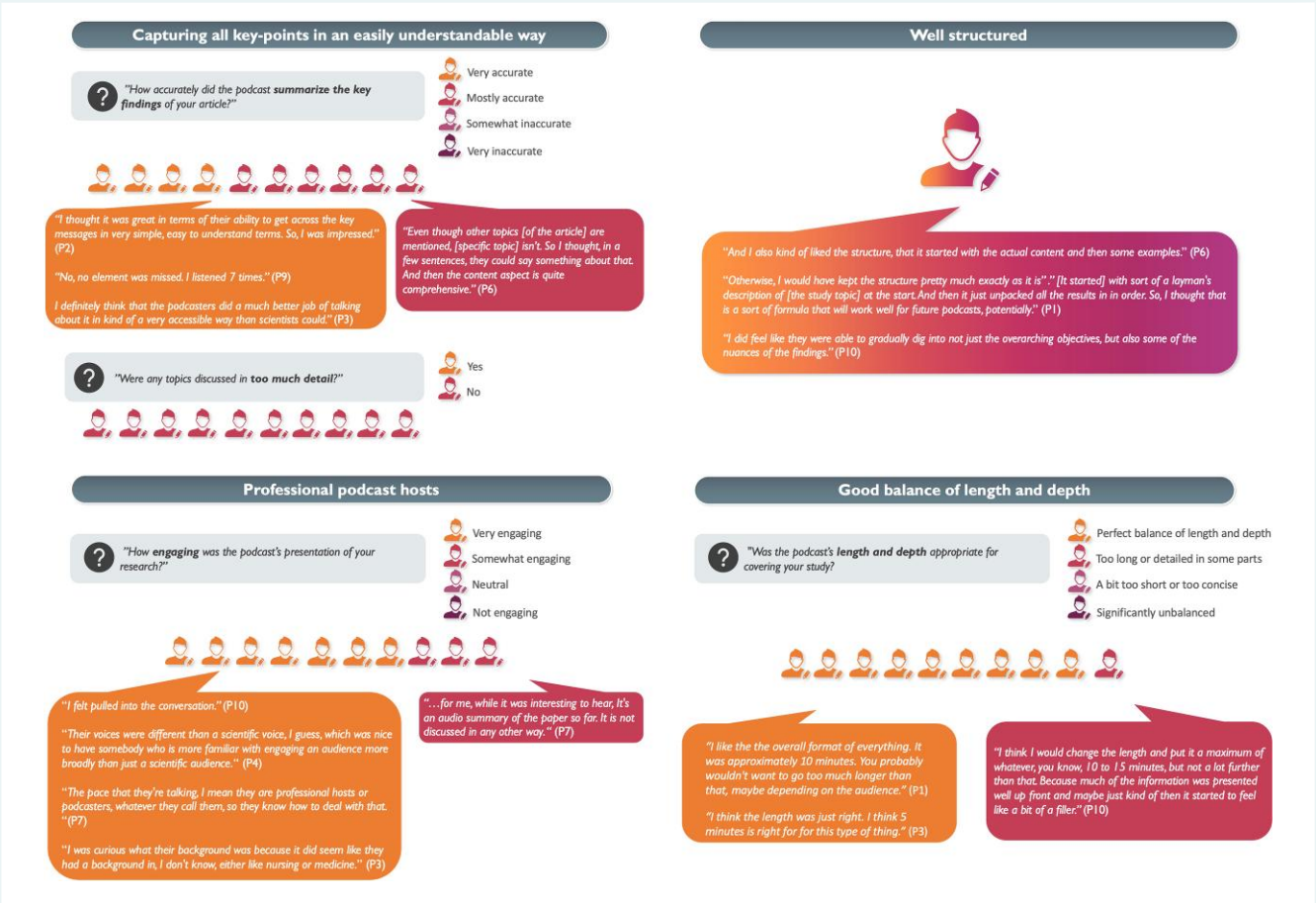


Figure 1 Engagement.

patient empowerment is about people being able to choose whether they want to follow a treatment or not. In the same light, someone pointed out that obesity was incorrectly being referred to as a habit, which '*makes it sound like a choice*' (P8).

Finally, some authors found mispronunciations of key medical words. One participant stated that, if listeners were familiar with these terms, this would take away from the podcast's credibility (*Figure 2*).

Artificial intelligence detection

When participants were asked whether they would be surprised if the podcast was generated through AI, half of the researchers, including one researcher who had previously conducted research on AI, had no clue. They stated that they were '*shocked*', '*amazed*' or even '*having an existential crisis*' (P7) (*Figure 3*). One author explained that she typically does not listen to podcasts, while other participants were regular podcast listeners. The five other researchers had suspected that the podcast was generated through AI or straight-up asked before we could come to the surprise question. Even then, however, they were still surprised of what it was capable of.

The main aspect that tipped the latter-off was the lack of filler words or vocal disfluencies that would typically be present in human conversations. In other cases, the hosts had said something that sounded strange or did not make sense to the participant, which raised their suspicions even more.

Potential for science communication

Potential target groups

Patients and the general public were found to be the most appropriate target group for these AI-generated podcasts, mainly because of the podcasts' tone and their ability to explain the articles in an easy-to-understand manner (*Figure 4*). Therefore, participants thought of it as an interesting way of making science more accessible to the lay public, as well as a way of including people that struggle with written text, for instance as a result of vision impairments or low literacy. Informing the lay public about research findings could also leverage opportunities for patient and public involvement.

In addition, two authors, one of which was the author of the patient perspective, found that the podcast could create a feeling of peer-support, enabling patients to relate to experiences described in the podcast.

As for researchers and healthcare workers, the podcasts could be a cost-effective and time-efficient way of staying up to date with the latest research findings. Accordingly, one participant thought of the podcast as a way of making the original research article more visible. Further, one researcher talked about healthcare workers experiencing difficulties when reading research articles. These podcasts could provide a convenient solution to that.

Tailoring

Participants indicated that the choice of the target group should determine the podcast's content and focus. If the podcast were to be directed at researchers, some authors suggested an additional

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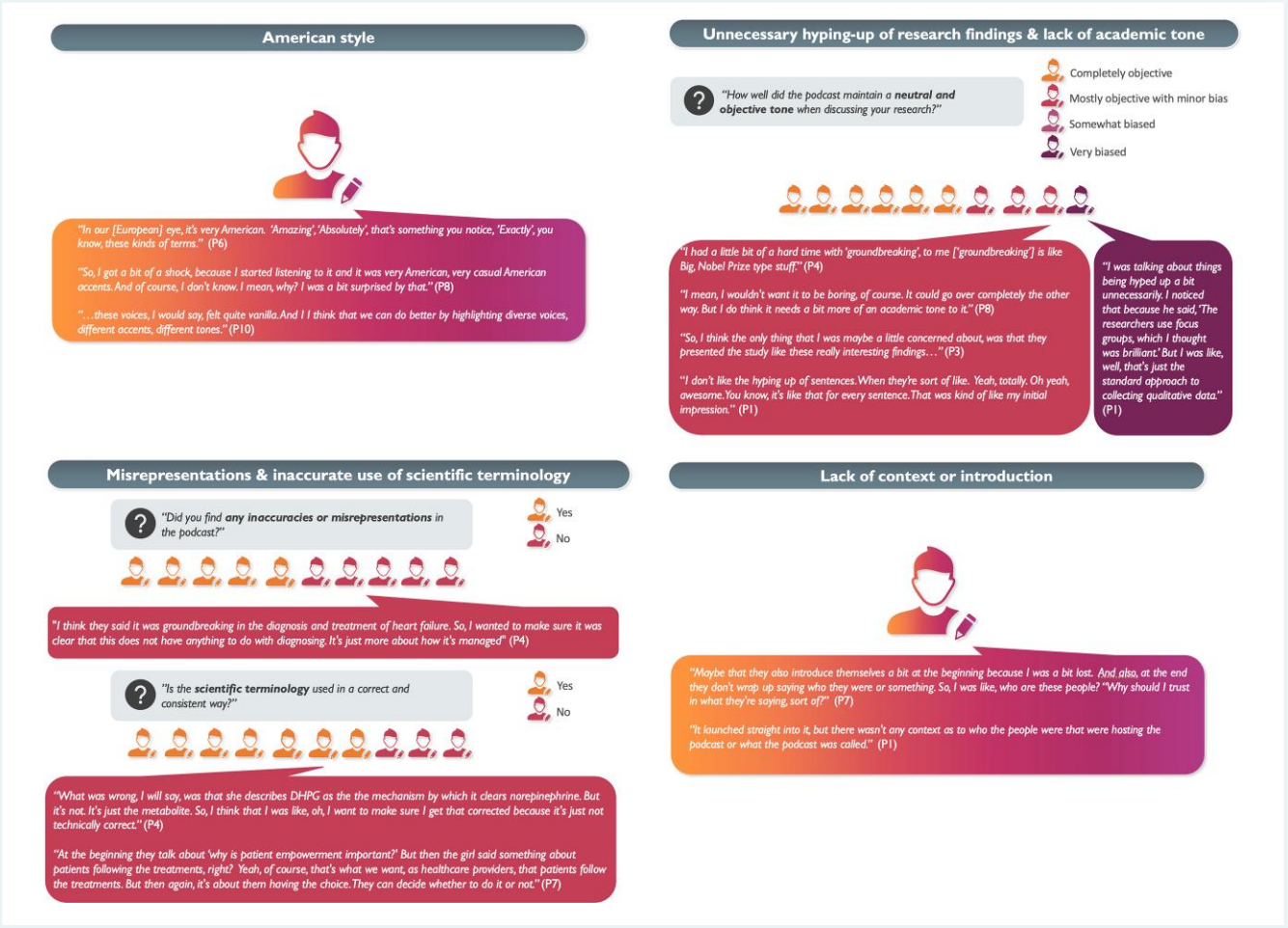


Figure 2 Trustworthiness.

description of the method section or highlighting some study limitations (*Figure 5*). Accordingly, one author found that the podcast would need to be more than merely a summary of the research article but rather be supplemented with some sort of criticism or discussion. Other participants found these additional nuances to be rather valuable for non-scientists, considering it would make them less likely to '*take everything at face value*' (P3). Researchers did however agree that the method section would be of lesser interest to non-scientists because it could unnecessarily confuse them.

One author believed that the podcast could particularly attract younger people. Indeed, reaching the older population could be challenging, because many of them may lack the required digital skills.

Considerations for implementation

The AI-nature of the podcast raised some concerns, which led to the formulation of some considerations that the authors deemed to be important. First, the podcast would need to be rigorously evaluated before its release (*Figure 6*). Preferably, the evaluation should be performed by an author of the paper to make sure that the podcast does not contain any inaccuracies. Second, it would need to be stated that the podcast was AI-generated, so that the listener could take this into consideration. Third, some found that podcast listeners should easily be able to locate the original article after listening to the podcast. Accordingly, a few authors discussed the need for author permission before generating these types of podcasts. One author stated that she would be more comfortable if she had the chance '*to sign off on it*' (P10). Additionally, because of its lack of vocal disfluencies, some participants felt like the human aspect was missing. As of this, they thought it would be more difficult for listeners to identify with the podcast or create a feeling of relational trust. Finally, knowing that you would need to repeatedly evaluate the podcasts to eliminate inaccuracies, one researcher questioned the added value of AI-generated podcasts: '*Is it better to just get the text and then you revise the text, and you do the recording by yourself?*' (P7).

Discussion

The popularity of podcasts as tools for medical education and science communication, along with the rise of advanced modalities such as AI-generated podcasts, leverage new opportunities for making science more accessible. However, the advantage of creating a podcast in a time-and cost-efficient manner should not outweigh potential compromising of quality and trustworthiness. Therefore, this study aimed to explore the quality of AI-generated podcasts and their potential for science communication.

The findings of this study showed that AI-generated podcasts are particularly effective in conveying the main message and key findings of a research article in an easily understandable and, for the most part, accurate manner. Indeed, the main goal of these podcasts is to summarize content and transform it into a more accessible format.

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Figure 3 Artificial intelligence detection.

For this reason, patients and the public were considered the most appropriate target group, allowing for better access to academic research.

Recently, several efforts have been made in attempt to make scientific literature more accessible to the lay audience. One widely encouraged initiative is the Open Access publishing of scientific research, which enables members of the public to access academic journal articles free-of-charge. However, little evidence exists on the actual use of research articles in the general population[31–33] and it is suggested that open access publishing alone does not automatically imply an increased uptake, especially not by the lay public.[31] Indeed, research uptake might be hindered by barriers such as the use of professional jargon and the extensiveness of research articles.[31] Therefore, it has become good practice to provide a lay summary with the research article.[31,34] This simplified version of the article abstract aims to describe the research in laymen's terms, thereby increasing its accessibility to the public. The present study showed that AI-generated podcasts have the potential to increase accessibility in a similar way.

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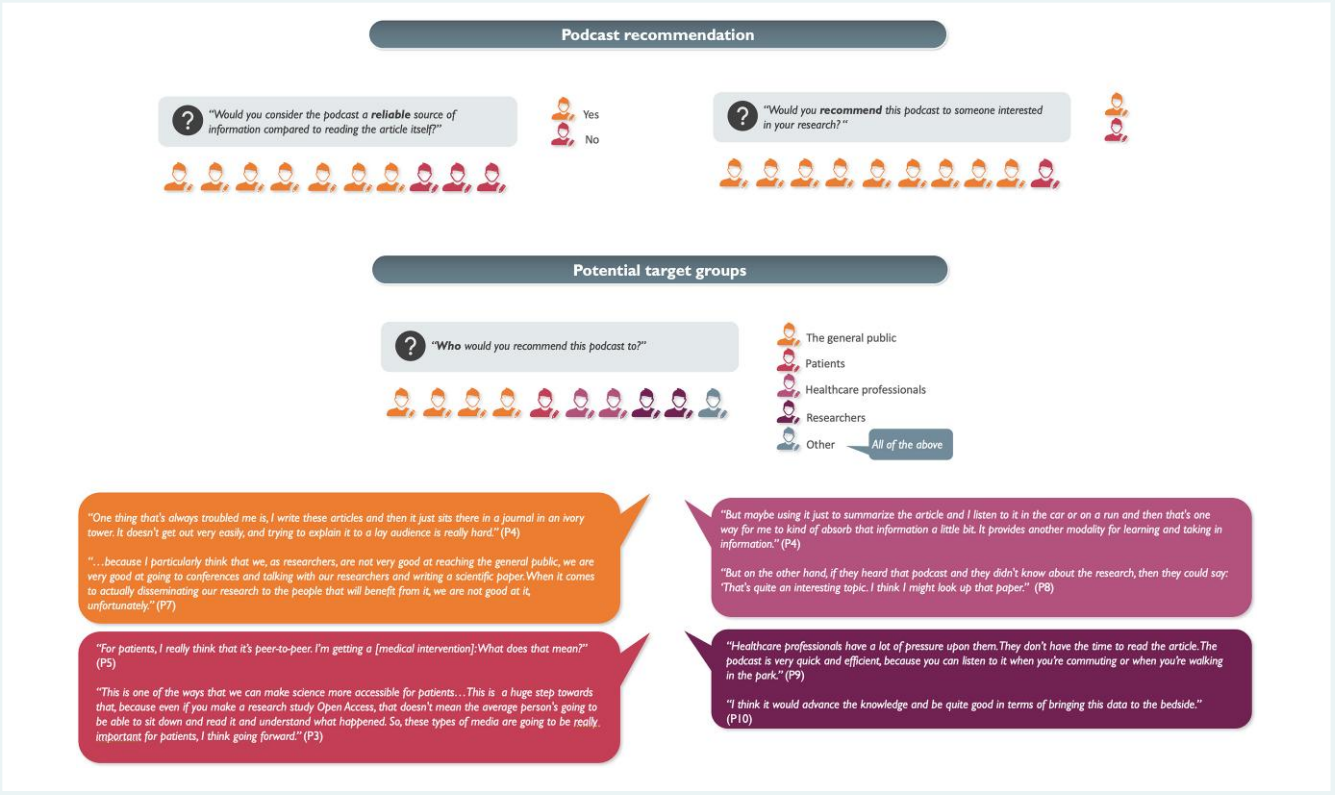


Figure 4 Potential target groups.

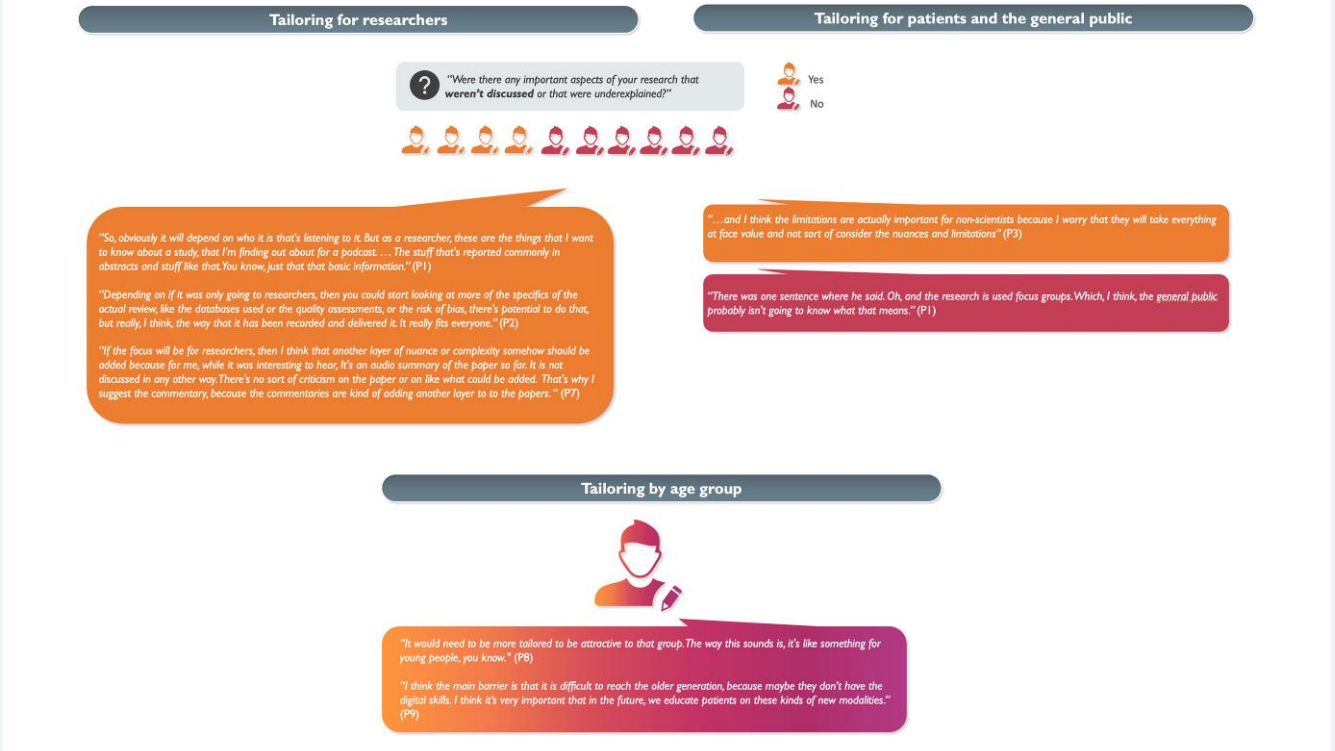


Figure 5 Tailoring.

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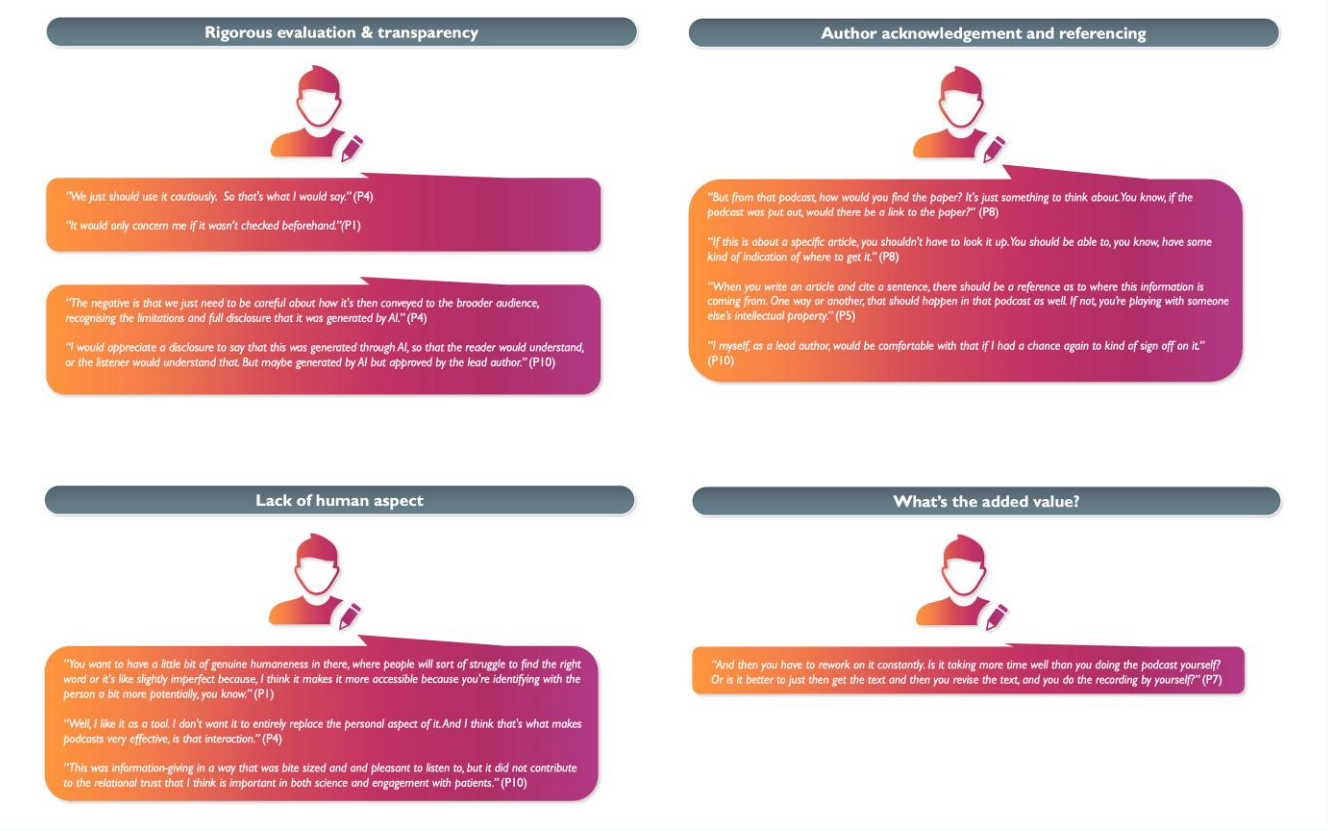


Figure 6 Considerations for implementation.

Yet, what sets podcasts apart from lay summaries is the way they are able to keep audiences engaged. In the current study, the conversation-like interaction of the podcast hosts was found to be a significant asset. Likewise, a dialogue-format, along with the inclusion of personal anecdotes and humour, was also found to be an important engagement factor to listeners of medical education podcasts.[2,35] In addition, our participants appreciated the length of the podcast, ranging between 5 and 17 min. Indeed, podcast duration is another aspect to be considered for keeping listeners engaged.[2] While most prefer short podcast episodes that are no longer than 30 min,[2,3,35] preferences regarding podcast length differ widely. For instance, a survey that explored public engagement with podcasts in specific scientific fields found that preferences regarding length and conversation style varied by age and educational status.[3]

This leads us to another potential benefit of AI-generated podcasts, which is tailoring. One way to tailor the podcasts is by prompting them to focus on specific content for different target audiences. For instance, a discussion of the methods would be appropriate for researchers, but was deemed irrelevant for patients and the public. Additional prompting could pertain to the tone of the podcast, which, according to study participants, should sound more academic for researchers as opposed to other audiences. Furthermore, podcasts could be personalized by means of user language and other audience characteristics (i.e. age, education, ethnic background, interests…) in order to increase engagement and uptake of scientific information. Indeed, a recent study found that personalized AI-generated podcasts increased learning outcomes of college students compared with non-personalized podcasts and textbooks.[36] To date, it is not possible yet to adapt the podcast length, nor the language or voices to users' preferences, but it is very likely that NotebookLM will enable this feature at some point in the near future. More research is needed in order to assess the value of tailoring with prompting for AI-generated podcasts.

To ensure podcasts' quality, creators should warrant that factual information is conveyed to the audience. Furthermore, to enhance a sense of trust and therefore increase the podcast uptake, listeners should also feel like podcasts are a credible source of information. Although AI-podcasts were considered reliable sources of information by most participants in the present study, we identified a few aspects that could compromise trustworthiness. These included: research-specific inaccuracies and misrepresentations, incorrect use of medical terminology, mispronunciation of words, and lack of nuance when presenting research findings. Yet, limitations pertaining to podcasts' scientific content quality seem not to be restricted to AI-podcasts only. Indeed, more than one-third of traditional science podcast hosts do not have a scientific background.[1] Moreover, because of the fairly minimal skills that are required to create a podcast, along with the lack of peer-review, a considerable amount of science podcasts are of low quality.[6] Consequently, a lack of scientific rigour could lead to misinformation with potential negative implications for decision-making processes. Before publishing, academic journals should therefore thoroughly evaluate podcasts to ensure that their content is scientifically accurate and state the evaluation process to enhance trustworthiness. Furthermore, it is recommended to obtain formal approval from the authors of the article, as well as to reference the original article to be in line with intellectual property regulations, especially when publications are non-open access.

Finally, important consideration should also be given to podcasts' delivery methods. Nowadays, the most common way to access a podcast is through streaming platforms such as Spotify or Apple Podcasts. However, not everyone may be familiar with these platforms. Older

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generations or people with low education, for instance, may lack digital literacy, hindering them to access digital information sources.[37] Furthermore, the abundance of science-related podcasts could lead potential listeners to be overwhelmed. At the same time, low-quality podcasts would expose listeners to less accurate information. That is why researchers and healthcare journals should generate or promote high-quality science podcasts. One method would be to inform clinicians and patient organizations about appropriate podcast series, which could, in turn, redirect potential audiences to these podcasts. In addition, linking podcasts to social media platforms such as Facebook and X, was found to be a feasible and effective way to reach target audiences.[38]

Methodological considerations

To the best of our knowledge, this is the first study that evaluated AI-generated podcasts on articles published in a scientific journal. To date, two other studies have evaluated the use of AI-generated podcasts of textbook chapters and teaching material in college students[36] and nursing students.[39] Given this is an innovative technology, the findings of the present study can serve as a benchmark for further research on this subject. A considerable strength of this study was the inclusion of a variety of article types and authors, allowing to capture a broader range of perspectives. Furthermore, the fact that we did not disclose beforehand that the podcasts were generated by AI helped to avoid any bias that might have resulted from prior knowledge.

Nonetheless, some methodological limitations should be considered in the interpretation of the data. First, it should be noted that exploring the quality of GenAI remains a challenge, since no existing procedure for such evaluations exist. Therefore, this evaluation is in no way exhaustive and future evaluations could include additional aspects to be assessed. Second, this study included only 10 participants. Moreover, all the research articles were published in the *EJCN*. Therefore, the present study should be seen as a very first and definitely not final evaluation of the potential value of AI-generated podcast. Our findings cannot be considered to be generalizable. Third, qualitative analysis was performed by one researcher only, thereby increasing the risk of interpretation bias. Fourth, it should be noted that NotebookLM is not the only tool that enables AI-podcast creation. Other tools (e.g. Jellypod, Wondercraft, Monica…), accompanied by different features, could have arguably led to other podcasts and thus different outcomes. Fifth, we included only the authors of the selected articles. Future research should also evaluate the perspective of healthcare professionals, patients, or other members of the public on AI-generated podcasts and look at personalization opportunities that come with it, as these groups are potential target audiences.

Conclusion

This evaluation showed that AI-generated podcasts could be suitable additions to articles published in scientific journals and valuable alternatives for traditional science podcasts. Being able to convey the main message and key finding of a research article in an easily understandable manner while also engaging the audience was deemed a key asset of these podcasts. While patients and members of the public were considered the most appropriate target audiences, the podcasts could be tailored to any target group, thereby increasing its accessibility. However, limitations pertaining to their trustworthiness, such as inadequate use of medical terms and misrepresentations, should be taken into consideration. Therefore, a rigorous evaluation should be performed before podcasts are disseminated. The podcast should be accompanied by a statement that the podcasts were generated through AI and a reference to the original article. With that in mind, AI-generated podcasts have the possibility to increase accessibility and uptake of scientific knowledge information.

Supplementary material

Supplementary material is available at *European Journal of Cardiovascular Nursing* online.

Author contributions

C.P.D.: conceptualization, methodology, formal analysis, data curation, writing—original draft; W.B.: writing—review & editing, funding acquisition; M.D.V.: writing—review & editing; P.M.: conceptualization, methodology, validation, resources, visualization, supervision.

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Conflict of interest: P.M. is Editor-in-Chief of the *European Journal of Cardiovascular Nursing*. Hence, in line with the journal's conflict of interest policy, this paper was handled by Jeroen Hendriks.

Data availability

Data are available at reasonable request.

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