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Citizen visions for European futures—methodological considerations and implications

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Abstract

In recent years, citizen involvement has been increasingly recognised as a source of complementary insights to expert-based foresight. This article analyses citizen visions on desirable and sustainable futures gathered in three recent European involvement projects and reviews how the methodology of topic modelling can be applied to identify commonalities in the visions and how the identified topics are distributed across the citizen involvement projects. A common topic addressing a European citizen desire for wide-ranging societal development with an emphasis on education was identified in the modelling. In addition, three specific topics that correspond to the foci of each involvement project were evident: 'local production', 'cultural variety' and 'concerned collectives'. Hence, the results indicate that there are further opportunities for further citizen involvement activities and that specifically focused open-ended envisioning events can contribute to unique sets of citizen-induced topics for the future. These results are particularly useful for the institutionalisation of citizen involvement in foresight studies.

Keywords: Citizen visions, Foresight, Topic modelling, Sustainability, Citizen involvement

Introduction

Citizen involvement has in recent years become an increasingly accepted procedure in foresight studies. The practice of involving citizens has aimed to complement expert-based foresight (see [1] on the potential of participatory foresight, [2] on focus on experts and [3–5] for examples of expert-based studies). In addition, involving citizens in foresight provides accountability for citizen concerns in a globalised world [6–8]. Indeed, the European Union has recognised the potential benefits of citizen involvement in foresight and accordingly offered opportunities for citizens across Europe to articulate their visions on desirable and sustainable futures in three forward-looking projects (Civisti 2009, Casi 2015 and Cimulact 2015–2016). Scholars, in turn, have used these visions as a first step to identify citizen-induced agendas for European research and innovation.

These visions provide a unique opportunity to examine European citizen sentiments and values concerning the

future because the citizen involvement methodology applied to create the visions and the format of the visions have been uniform in the conducted European involvement projects. The task of producing comprehensive analyses of the visions has however proven to be arduous. This is partly due to the rich character of the visions in the sense that each vision may relate to a number of topics, making the visions hard to categorise. Furthermore, an established methodology for analysing the visions has not emerged yet, which has prevented the analysis of visions across projects. Instead, the visions have been analysed inductively and qualitatively within each project, thus connecting the visions to project procedures rather than to comparative methodologies [9]. The lack of an established methodology for cross-project analysis has also prevented the reflection or the positioning of new sets of citizen visions against the previously produced ones.

The novel contribution of this article is the utilisation and assessment of methodological developments in the field of digital humanities in the analysis of large collections of textual data and the topical distribution of texts from different instances. We rely on the methodology of topic modelling [10], which has become increasingly

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popular in academic research [11–13]. Our study has a twofold research objective. Firstly, we examine if it is, in general, possible to identify common topics in citizen visions on desirable and sustainable futures. Secondly, we review if the prevalence of these topics varies across citizen involvement projects. The article argues that topic modelling is a promising methodology to be applied in analyses of citizen contributions in futures studies. The results of this article further confirm the validities of both the involvement and the modelling methodologies.

We next present the settings and key features of the three examined citizen involvement projects, followed with a description of the application of topic modelling of the citizen visions. Our results show how the examined citizen involvement projects produce an uneven distribution of topics, highlighting specificities in the outcomes irrespective of the application of uniform formats of visions and involvement procedures in the projects. The concluding section discusses our findings, emphasising that while the examined involvement projects bring forth a shared European citizen desire for wide-ranging societal development with an emphasis on education, we also observe a connection between the foci of the involvement projects and the topics that emerge in them. The results imply that open-ended, deliberative citizen involvement should strive to address issues also beyond the most general and apparent topics.

Citizen involvement for sustainable futures

Addressing citizens as contributing foresight actors provides a largely untapped resource for foresight studies. Accordingly, developing and institutionalising procedures for citizen involvement in foresight [14, 15] would help scholars to find their way amongst the myriad of methodologies and aims [16, 17]. Apart from helping to overcome problems accrued from a democratic deficit in foresight due to heavy reliance on experts, citizen involvement may also reveal knowledge that experts do not identify as relevant or value highly [1].

In particular, futures research has utilised a ‘backcasting’ approach [18–21] to identify pathways to reach societally desirable targets. In three major projects funded by the European Commission (Civisti, Casi and Cimulact), citizens co-authored a total of 298 visions for desirable futures. Involving citizens in this way complements the large number of expert-based foresight studies conducted in recent years and can be considered as an early example of the institutionalisation of citizen involvement in foresight that targets European science and innovation policies.

The approach used in the formulation of citizen visions follows a method first introduced in the European research project Civisti [22–24]. The aim in the design of this method was to bring citizens together in workshops to contemplate, deliberate and envision preferred

directions for the future. These workshops were laborious and lasted a full day or two to give the participating citizens sufficient time to engage in in-depth discussions with each other. The vision building workshops adhered to the principle of not imposing any pre-set agendas or any specific themes on the citizens. Instead, they tapped on the themes that the citizens brought up themselves when imagining the future and adhered to a uniform process created in the Civisti project for vision building in workshops which were organised during a short time period in all the participating countries. In addition to the uniform method of citizen involvement, the produced outcomes (i.e. visions) also had an identical structure. This method was thus designed to bring out the citizens’ ‘authentic’ views and structure them in a unified format.

The latter European citizen involvement projects, Casi and Cimulact, have further applied the method with similar procedures and for similar aims when conducting citizen involvement. In addition, the visions produced in the three projects have followed the same, uniform format. The projects were undertaken within the same programmatic research direction with an emphasis on public engagement in society and in science, and the objective of all the three projects was to identify forward-looking, citizen-based ‘authentic’ agendas for European research and innovation policy [23]. Example 1 presents one of the visions created in the Civisti project, and examines a novel, environmentally friendly way of producing energy, while also covering parallel topics such as housing, transport and recycling.

Endless energy (Independence of fossil fuels. Local and environmentally friendly production of energy).

Every home has its own energy production, making use of solar cells, a wind turbine or maybe even the home trainer. The solar heat is stored in an underground water tank and used for the heating of the house. Every housing unit is independent and provides for its own energy supply, in an environmentally friendly way. New-built dwellings, public housing included, are entirely recyclable and have a mandatory integrated energy supply, environmentally friendly and safe. Cars are electric and their batteries are charged at home. This all results in clean air. Available for everybody. Granting of the necessary credits.

Example 1. Excerpt from citizen vision from Belgium: Endless energy [25].

Citizen vision workshops are thus in the core of involvement methodology. An important target of the method is to create a large number of visions that cover

themes that citizens themselves find of interest. Prior to the workshops, the citizens receive information material, which is intended to inspire them to think of desirable futures. The envisioning events are succeeded by expert activities, which guide the citizen contributions towards research and innovation priorities for the European Union (Fig. 1). Accordingly, the citizen visions are further developed to priorities or scenarios by experts and stakeholders (Civisti and Casi) or in co-creation involving citizens, experts and stakeholders (Cimulact). At the final stages, these outcomes are validated or enriched by citizens.

Our research was motivated by the realisation that while scholars and policy makers have made considerable European-wide efforts to scan citizen sentiments on desirable and sustainable futures, the particular contributions of each exercise remain unclear, as do the potential benefits of conducting additional, related exercises. In this study, we perform the first attempt to assess these concerns through a joint analysis of citizen visions formulated in the three European involvement projects. Accordingly, we identify common topics in the visions and then assess how the topics are distributed across the involvement projects. The granularity of the topics is quite large due to the research design of this article, and the topics address broader concepts rather than specific questions. This design ensures distinct observation of key topics and differences in the topical distribution across the projects.

Indeed, the previously conducted content analyses of the visions have not been comparable, as Civisti's 69 visions were analysed through 37 topics [26, 27], Casi's 50 visions were expressed in 8 topic clusters [28] and Cimulact's 179 visions were explored in 12 domains representing 29 underlying social needs [29, 30]. The project managers or researchers have not previously attempted to analyse these visions jointly, which can be regarded as a missed analytical opportunity. At the same

time, the rich variety of these visions does enable many kinds of comparisons. The three projects have attempted to go beyond simple categorisations, accounting for cross-cutting themes in their analyses of the respective visions [9, 26, 28, 30]. We consider such an approach beneficial in the sense that it acknowledges that citizen visions in general can range across many themes and that each vision can include a number of themes.

While the examined projects all used the same methodology for formulating 'authentic' citizen visions and eventually research priorities based on them, they differed in their special focus. The Civisti project was realised in seven countries [32] and it had a quite general focus (see Table 1). The Casi project was carried out in 12 countries and it focused on innovations that contribute to sustainability [28, 34]. Cimulact was the last and the largest project in terms of participating countries (30) and the created visions (179). Its focus was to create socially robust needs-based sustainable and desirable futures for European citizens [24]. The following section presents the method of topic modelling used in the analysis of the altogether 298 citizen visions created in these projects.

Methodology

We analysed the 298 citizen visions by means of topic modelling, which is a methodology suitable for the analysis of large sets of unlabelled texts [10, 35]. Topic modelling identifies probabilistic collocations of words, which together form topics [36, 37]. In principle, any number of topics can be used in the modelling, which is a useful methodological feature that can be used to connect the methodology to the research design.

The method is well suited for the analysis of a corpus of visions, where each vision can consider more than one theme. We utilised the MALLET toolkit for statistical natural language processing to apply Latent Dirichlet Allocation (LDA) in the conducted topic modelling¹

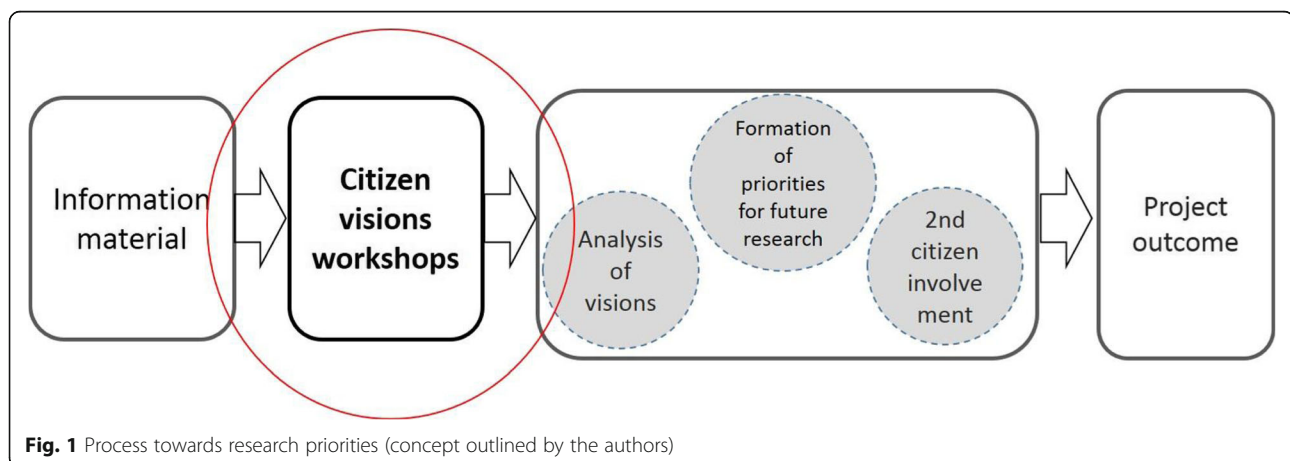


Fig. 1 Process towards research priorities (concept outlined by the authors)

Table 1 Characteristics of the examined citizen involvement projects

Involvement project	Participating countries	Time of involvement	Special focus	Number of visions
Civisti	7	2009	AIDS; Alzheimer's; bio-energy; biotechnology; democracy; global perspective; nanomedicine; science; sustainable development; variety	69
Casi	12	2015	Environment; economy; social well-being; sustainability; innovation initiative; sustainable future; circular economy	50
Cimulact	30	2015–2016	Desirable future; democratic process; societal challenge; children; equality; city and village; freedom and security	179

Data are compiled from [28, 30–33]

[38]. In addition to the identification of topics in the corpus, we further observed the relative weights of the topics as well as their distribution in the visions across the three citizen involvement projects.

Topic modelling was conducted with four topics and ten sampling iterations. We chose four topics since this allowed us to observe both a general topic that extended across the projects and potential distinct topics for each project. The hypothesis that there could be a general topic was supported by previous research on the visions in the Civisti and Cimulact projects, which recognised the significance of the theme of education [9, 23, 26]. Three additional topics were observed, as this was the minimum number to enable project-specific topics to emerge. Pilot modelling confirmed that results with four topics followed those with greater numbers of topics, indicating the fit of the methodology for the research task.

The connection between the topical distribution and the project foci is constructed through an analysis of the information material that each project sent to the participating citizens before the involvement activities. These so-called inspirational magazines were reviewed with a special focus on their editorials [31–33]. Through a content analysis of the inspirational magazines, we identified key words and focus areas for the projects (see Table 1).

Results

Topic modelling was applied to examine the corpus of citizen visions on desirable and sustainable futures for two specific aims. Firstly, modelling was used to identify topics ranging across the three involvement projects. Secondly,

we reviewed how these topics were distributed across the projects. An even topical distribution would indicate that the involvement procedure produces uniform results while an uneven distribution would accentuate specificities in the outcomes of uniform involvement procedures. The results of the modelling point towards the latter scenario, which is discussed at the end of this section.

The modelling analysis shows that the corpus of 298 citizen visions can be examined through four topics. The topic with the greatest weight (Dirichlet parameter 7.05) was labelled 'development for people' based on an analysis of the key words of the topic and on additional analytics that the modelling provides. The other topics were labelled 'local production', 'cultural variety' and 'concerned collectives' through a similar procedure. Their weights are lower in the corpus, with Dirichlet parameters ranging between 0.20 and 1.31, thereby indicating that there indeed is relevant topical variety in the corpus. Table 2 presents the labels, Dirichlet parameters and key words of the four examined topics.

The most extensive topic, dealing with the 'development of people', is of general character and brings forth a broad view of human futures. It is concerned with issues ranging from education to technology, from energy to health and from family to society, and it embraces a view of the world in its broader complexity and multiplicity. The topic corresponds to outtakes of the Cimulact project, which highlight that the outlooks of European citizens consist of sustainability in the economy, health concerns and fairness in communities [9] and education [23, 39].

Education and learning came up as key topics in the Civisti project [26], for example in a vision named

Table 2 Topics in citizen visions in the examined involvement projects

Label	Dirichlet parameter	Key words
Development for people	7.05	people education energy life society vision social work development system health resources family community time environment future citizens technology production
Local production	1.31	farming urban products city quality benefits activities network needed industry regulation local economy sustainable contribute insects citizens cannabis small decrease
Cultural variety	0.44	language children benefits families dying electric transportation research means s/he population countries his/her channel science information years people's cars learn
Concerned collectives	0.20	desirable collective hours treatment concern replaced flexible critical choices consideration nowadays days challenges shorter neighbourhood grown turn housing balanced cradle

Holistic education. Education also has key importance in citizen visions gathered in the Cimulact project and relates to *Lifelong learning*, *Free access to education* and *Community enrichment through education* [23]. In the Casi project, social development and people as well as values and politics emerge as important dimensions of the visions and are particularly evident in visions such as *Society of understanding* and *Society of potential capacities* [28]. Energy as a source of societal development was also highlighted in visions such as *Distributed small-scale energy generation in mainstream within 30–40 years* in Casi (ibid.) and *Endless energy (Independence of fossil fuels. Local and environmentally friendly production of energy)* in Civisti [26].

The topic ‘local production’ is prominent in the innovation-oriented Casi project and deals with farming and urban production of food. For instance, the vision *Urban farming* considers green gardens on rooftops and balconies as well as bee cultivation for honey, *Insect food* is seen as a source of nutrition for humans and *Eco-preneurship—Sustainable business for the future* [28] addresses the sustainability of local production and local economy and the benefits of networking local economies. These perspectives are visible in some visions for local production and networked industries also in the Cimulact project [29] but to a much lesser degree.

The topic of ‘cultural variety’ relates to language, children and families and arose especially in the visions of the Civisti project. In previous analyses of the project, the themes of healthcare and medical services, ICT, automation and artificial intelligence, legislation, quality of life and life style, employment and new modes of work and energy further elaborate the topic [26]. The vision named *Europe as a welfare state* further recaps the topic.

‘Concerned collectives’ relates mostly to the visions of the Cimulact project and considers how collectives of people connect to desirable futures. The topic is especially visible in visions such as *We are one community!* or *Community as an asset* [29].

Accordingly, the labelling of the four topics corresponds well to the examined citizen visions, and the topics appear to distribute unevenly across the involvement projects. To examine to which extent this is the case, we further performed topic modelling of the citizen visions according to project (Table 3). These results show, as expected, that the major topic of ‘development

for people’ cuts across all the three citizen involvement projects, with weights ranging from 61 to 79%.

The analysis further confirms that the three other topics are specific to each citizen involvement project. The innovation-oriented Casi project contributed to citizen visions relating to ‘local production’ (35%), the generally positioned Civisti to ‘cultural variety’ (37%) and the more generally sustainability oriented Cimulact to ‘concerned collectives’ (16%). The results indicate that the aims and characters of each project seem to influence the topical outcomes of the inclusive citizen involvement. Table 3 further shows that the selected topical granularity performed well in the examination of the topical distribution between the projects.

This observation concerning the uneven topical distribution can indeed be explained by a comparison between the foci of each project and the information material provided in advance to the involved citizens. The topic ‘local production’ prominent in the Casi project highlights environment, economy, social well-being, sustainability, innovation, sustainable future and circular economy. Similarly, the topic of ‘cultural variety’ in the Civisti project relates to both societal and health issues (democracy, global perspective, sustainable development and variety vs. AIDS, Alzheimer’s, bio-energy, biotechnology, nanomedicine and science). Finally, ‘concerned collectives’ is particular to the Cimulact focus on desirable future, democratic process, societal challenge, children, equality, city and village, and freedom and security. The relevance of the uneven topical distribution is further accentuated in how the information materials reflected the project foci, although their structures were quite similar and they presented background information in a neutral way.

As there are explainable connections between the foci of the involvement projects and as the topical distribution of the citizen visions is uneven, it is unlikely that the observed differences should be attributed to randomness. This, in turn, raises concerns on the validity and reliability of the citizen involvement procedure. Yet as the involvement procedure is deliberative and open-ended by design, it is safer to consider the topics as strategic outcomes of citizens interacting with each other and in accordance with the project settings. This apparently intrinsic feature of citizen involvement in foresight can further be used to guide open-ended involvement projects into given settings albeit without

Table 3 Distribution of topics across the examined citizen involvement projects

	Development for people (%)	Local production (%)	Cultural variety (%)	Concerned collectives (%)
Casi	65.4	34.5	0.0	0.0
Civisti	61.1	1.4	37.3	0.1
Cimulact	78.6	4.4	0.6	16.3

any strictly predetermined directions. This is further discussed in the upcoming section.

Conclusions

This study has identified topics in visions on desirable and sustainable futures, which were authored by citizens in connection to three European projects: Civisti, Casi and Cimulact. Involving citizens in such foresight provides a parallel and analogous procedure to expert envisioning [14] and could be further institutionalised to an established form of foresight [2]. The benefits of considering participatory processes in backcasting exercises such as those performed in the examined projects have been observed before [19]. In particular, involving citizens is an apt way to avoid potential knowledge deficits prevalent in expert-only foresight activities [1]. While the examined three involvement projects were institutionally situated, methodological rigidity may itself further strengthen institutionalisation as it enables citizen involvement at a larger scale due to economic and accessibility reasons (through online involvement and analysis, for instance) and is apt to lessen the influences of vested interests in the interpretation of results [9]. Methodological openness, comparative metrics and sustaining a connection between citizen contributions and their applications further lay good ground for incorporating involvement procedures in policy processes.

In the visions data, we identified one common and three particular topics, each relating to a specific involvement project. All the three projects bring forth a European citizen desire for wide-ranging people-centred societal development that links to education ('development for people'). In addition, we also found three topics that connect to the foci of the respective involvement projects: 'local production', 'cultural variety' and 'concerned collectives'. The emergence of the project-specific topics suggests that outcomes of open-ended vision building processes are influenced by the project focus. The inspiration magazines used as an information base for the involved citizens indeed connect to the project-specific topics.

Since citizen visions on desirable and sustainable futures are rooted in slowly changing values [21, 39], the emergence of a common topic across the three involvement projects indicates that the applied procedure of developing citizen visions and the methodology of analysing them through topic modelling both are robust procedures. Education as an integral part of broad, people-centred societal development is the most prevalent topic in contemporary citizen visions, which was also recognised in the previously conducted separate analyses of the three projects [9, 26, 28, 30]. This result is not however of a final character as citizen values do change, sometimes even to an unexpectedly high degree [21, 40]. Accordingly, there is still a need to conduct additional general involvement activities

when attempting to see into the future, if not for any other reason than to review if the topic of education will continue to remain of similar key importance for citizens.

Yet it might be the identification of the other topics and their connection to the foci of their respective involvement projects that contributes to the call for additional citizen involvement in foresight. The organisers of deliberative citizen involvement processes typically attempt to make sure that they give rise to neutral and unbiased results [16] and that strategic selections are made only after an analysis of the contributions of the involvement has been conducted in accordance with the conventions of backcasting [18–20]. The realisation of this target is clearly challenged by our results. It rather appears that in addition to the overarching education topic, citizens contribute to topics that connect to the particular settings of the given involvement project. Indeed, as the involved citizens have been informed of the sought project impacts, they may well see this as a strategic opportunity to address issues and problems that they believe have potential to be realised. We suggest that this may be an intrinsic and contextual feature of involvement projects rather than an unintended outcome.

This strategic turn is something that has been identified and even counterbalanced in citizen involvement projects but clearly would merit more scholarly attention. Rather than seeing it as a shortcoming of attempts to bring forth 'authentic' citizen views (see [17] for a critique), scholars would benefit from an acknowledgement of the feature and of its incorporation in their citizen involvement projects. Eliciting deliberated citizen-induced strategic messages may in some settings be of greater importance than simply surveying citizen sentiments or values. Such acknowledgement would also reflect the ongoing professionalisation of citizen involvement procedures [16] and mark an important step from naivety towards strategic citizen foresight. After all, why would citizens be any different than experts in their capacity to contribute to different kinds of foresight on each separate involvement occasion?

It is similarly important to recognise that citizen contributions to foresight evolve over time and vary according to context. This, in turn, provides an empirically identified rationale to institutionalise citizen involvement in foresight [2]. Of course, organisers of citizen involvement should be aware of the effects of their project aims on the outcomes of the involvement and not naively see their results as fully representative or neutral. Concurrently, special attention should be paid to the content of any pre-distributed information material to counterbalance unwanted normative guidance.

The results, therefore, show that there is room for specifically targeted visionary citizen involvement activities, as each involvement activity produces unique sets of

topics. Hence, more citizen involvement is called for and it can be adjusted to suit specific aims and settings. There have however, until recently, been no attempts to establish a systematic comparative methodology to analyse citizen visions. This study has contributed to the set of tools for such analyses by introducing topic modelling to this aim, as it allows for systematic analysis of data sets representing large topical variety.

Topic modelling provides a reasoned way to compare citizen involvement contributions across instances. It does not dictate an optimal number of topics. Instead, the researcher connects the number of topics to be identified to the research design, which in this study was focused on examining common and specific topics across three European involvement projects. Consistently, a greater number of topics could have been examined to provide more detailed insights into the citizen topics and their distribution across the involvement projects. This is an opportunity for further text-based research, which focuses more on the content than the distribution of topics. Comparability would also benefit from accounting systematically for a higher number of European countries.

Moreover, we were not ultimately aiming for a thorough analysis of the contents of the vision topics but rather pursuing the twofold aim of examining if common topics can be identified in citizen visions and if the prevalence of such topics varies across citizen involvement projects. The study, thus, shows that topic modelling as a methodology lends itself well to the analysis of comparable citizen-generated and forward-looking texts. If open-ended citizen involvement exercises were to be frequently carried out in the future, topic modelling could further be used to examine how topics develop over time. Further, we suggest that topic modelling could be utilised as a methodology also in other foresight studies that examine large sets of texts.

Endnotes

¹MALLET is a freely available toolkit for statistical natural language processing [38]. Latent Dirichlet Allocation (LDA) is a generative probabilistic model for discrete data [10] and is applied in this article to identify collocations of words that together form meanings, i.e. topics.

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Availability of data and materials

The citizen vision data are available on the websites of the examined projects as described in the reference list.

Authors' contributions

PR and KM contributed to all parts of the article. Both authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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