In dialogue with users: co-designing AlicIA, an application for the adaptation of short stories in Spanish into easier versions

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Abstract

Collaborative design (or co-design) involving users with disabilities plays a critical role in the development of accessible and user-centred digital solutions. However, most existing applications for accessible text adaptation are created without the active involvement of the people they aim to support. To address this gap, this work presents a participatory design process carried out with individuals with cognitive disabilities to collaboratively shape the user interface of AlicIA, a web- and mobile-based application for adapting short stories in Spanish into accessible versions, following the Easy-to-Read (E2R) Methodology. The feedback gathered during the co-design session served as a basis for concrete decisions on the design of the user interface, the inclusion of accessibility features, and the use of visual aids such as pictograms. Framed within the principles of Responsible Artificial Intelligence (AI), this work underscores the importance of recognising users with cognitive disabilities as active contributors in the development of AI-supported tools for cognitive accessibility.

Keywords

cognitive accessibility, easy-to-read methodology (E2R), collaborative design, short stories

1. Introduction

Access to information is a fundamental right and a key condition for full social participation. However, there are different groups of people who present difficulties in comprehension, including people with cognitive or intellectual disabilities. Since these groups have the right[1] to actively participate in aspects of society, such as politics, education, work, and culture, on an equal basis with others, achieving cognitive accessibility is crucial to enabling inclusive communication and understanding.

Culture, in particular, plays an essential role in transmitting knowledge, fostering identity, and encouraging self-reflection. For people with cognitive disabilities, being able to engage in leisure activities, especially through the appreciation and understanding of literary texts, is not only enriching but also a matter of inclusion[2]. To support this right, cultural materials, and literary content in particular, must be made accessible in formats adapted to diverse comprehension needs. In this sense, the Easy-to-Read (E2R) Methodology [1, 2, 3] provides a pathway to enhance the cognitive literacy of people with comprehension difficulties, contributing to the realisation of these inclusive aspirations. The goal of this methodology is to present clear and easily understood contents to different sectors of the population by providing a set of guidelines and recommendations based on writing and layout aspects.

At the same time, technology plays a central role in daily life, facilitating communication and access to information. However, digital environments are not always inclusive. In particular, people with disabilities frequently encounter significant barriers when using digital platforms. This has led

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[1]Convention on the Rights of Persons with Disabilities (United Nations, 2006). Available at: https://www.ohchr.org/en/instruments-mechanisms/instruments/convention-rights-persons-disabilities
[2]https://www.plenainclusion.org/l/que-se-lea-facil/ (In Spanish)

to important initiatives such as the Web Content Accessibility Guidelines (WCAG) [4], which offer international standards to improve the accessibility of digital content. Within this broader framework, cognitive accessibility refers to the design of content and interfaces that are easy to understand and interact with and is a key component in ensuring that digital transformation leaves no one behind.

This work focusses on the inclusiveness dimension of Responsible Artificial Intelligence (AI), understood as the imperative to ensure that individuals with disabilities are not excluded from AI systems, but are instead actively involved in their design and development [5]. Specifically, our approach is based on a co-design (or participatory design) process, an increasingly strategy for inclusive technology development that involves users with disabilities as active contributors to the design process [6]. In this context, we present the co-design process of AlicIA user interface, a web- and mobile-based application for the automatic adaptation of short stories in Spanish according to the E2R guidelines. The user interface was designed through a participatory session with E2R validators with cognitive disabilities.

The rest of the paper is organised as follows: in Section 2, we present the State of the Art, including an overview of co-design methodologies with people with cognitive disabilities and the existing tools for accessible text adaptation. Section 3 describes the participatory design process conducted with users with cognitive disabilities. In Section 4 we introduce how the co-design process results were used in the implementation of AlicIA user interface. Finally, Section 5 presents some conclusions and future work.

2. State of the art

In this section, we provide (a) an overview of collaborative design and its relationship with cognitive disability, and (b) a review of current technological tools aimed at making texts more accessible.

2.1. Collaborative design and cognitive disabilities

Collaborative design (or co-design) is increasingly recognised as a key methodology for developing inclusive technologies, particularly when the target audience includes people with cognitive or intellectual disabilities [6]. Rather than positioning users as passive recipients of technology, co-design approaches emphasise their role as active contributors to the design process. Sanders and Stappers [7] emphasise the importance of viewing users as "experts of their experience" and highlight the need to provide them with appropriate tools for self-expression in the design process.

However, engaging people with cognitive disabilities in design processes presents unique challenges. Traditional co-design methods often rely on verbal expression, abstract reasoning, or symbolic thinking, which are skills that may be limited in this population [8]. Consequently, many standard techniques must be adapted or replaced with more accessible methods, such as mock-ups, visual prompts, simplified user interfaces, or tangible materials. As Hendriks and colleagues argue [8], rather than aiming for a one-size-fits-all methodology, design with people with disabilities must embrace individually tailored techniques (what they call "method stories") that reflect the real conditions and needs of participants.

Recent work has also highlighted the importance of relational and embodied forms of participation, where communication may be expressed through non-verbal means, affective responses, or subtle behavioural cues [9]. In this context, frameworks such as Active Support [9] have been proposed as ways to encourage participation. Moreover, collaborative design with people with disabilities is not only a methodological concern but also an ethical imperative. It aligns with the principles of the social and cultural models of disability, which shift the focus from individual deficits to the social and environmental barriers that limit participation [8].

2.2. Accessible text adaptation tools

Numerous web applications and tools have emerged in recent years to support text accessibility and simplification, especially for users with cognitive disabilities.

Regarding technological support to address the E2R guidelines and recommendations in Spanish texts, it is worth mentioning (a) Easy-to-Read Advisor [10], FACILE [11], Comp4Text [12], and E2R-Helper

[13], for an E2R analysis of documents; and (b) Simplext [14], LexSIS [15], DysWebxia [16], EASIER [17], and FACILE [11], to create adapted versions of original documents.

In addition to these, Clara[3] offers a data-driven approach to clarity evaluation. Instead of simplifying text, it predicts the comprehensibility of documents based on a set of nine linguistic and structural metrics, providing objective insights into accessibility. LeeFácil [18], for instance, is a prototype that extracts text from images and provides lexical support through definitions, synonyms, and pictograms. Although it does not simplify full texts, it contributes to enhancing lexical comprehension. EasyReading [19], a browser extension for Chrome and Firefox, includes features such as text-to-speech, layout adjustment, and pictogram overlays. Although its easy-to-read rewriting module was not operational during testing, its visual aids help support users with cognitive disabilities. PLACEAT[4] provides three types of adaptations: a simplified text, a pictogram-enhanced version, and a list of comprehension questions, along with a glossary. However, the application has not been updated since 2022.

These tools reflect the increasing interest in automating and supporting the creation of accessible content. Nevertheless, while some recent systems such as EASIER have adopted user-centred approaches and carried out evaluations with users with cognitive disabilities [20], most existing applications have been developed without involving users in the design of their user interfaces. In particular, participatory design sessions, where users are involved as co-creators rather than just testers, are still not adopted, especially in applications for adapting narrative literary texts such as short stories. To cover these gaps, we developed AlicIA, a tool for adapting short stories in Spanish into easier versions. A user-centred design process that included a participatory design session with individuals with cognitive disabilities was applied for designing the user interface of AlicIA.

3. Co-design session with people with cognitive disabilities

As mentioned in Section 1, this work is framed within the principles of Responsible Artificial Intelligence (AI), with a particular emphasis on inclusiveness. In this context, we adopted a human-centred approach [21] to ensure that the application reflects the needs and preferences of users with cognitive disabilities. According to Trewin [21], there are three main approaches to incorporating people with cognitive disabilities into the development of digital technologies: Inclusive Design, Participatory Design, and Value-Sensitive Design. In our case, we opted for Participatory Design, which actively involves end users in the design process and treats them as co-creators rather than passive recipients [22].

3.1. Procedure

We organised a participatory design session with people with cognitive disabilities to establish the basis for the development of the AlicIA user interface. The session took place on April 30 2024, and lasted approximately one hour. The participants included adults with cognitive disabilities, who were also E2R validators, from the ACCEDES organisation[5], based in Madrid (Spain). The participatory design session was structured following the methodological principles of a focus group, a qualitative technique particularly useful for eliciting shared knowledge and collective reflection among participants [23]. Focus groups are especially valuable for understanding not only individual opinions but also how participants interact, agree, or disagree around a given topic [24]. The session was moderated by the principal investigators of AlicIA, together with the support professional who regularly works with the participants. This professional played a key role in interpreting the mock-up proposals, rephrasing the questions when needed, and encouraging the participants to share their preferences. As noted by Lane et al. [23], the role of the moderator in focus groups is crucial to fostering inclusive participation, particularly through active listening and relational sensitivity.

To facilitate discussion, we prepared a PowerPoint presentation containing a series of mock-ups[6],

[3] https://clara.comunicacionclara.com/
[4] https://placeat.org/asistente-de-lectura-facil-placeat/
[5] https://accedes.es/
[6] Available at: https://zenodo.org/records/15682729 (In Spanish)

each illustrating different design alternatives for the AlicIA user interface. Although AlicIA is also a mobile application, it is important to note that all the mock-ups and feedback discussed in this session were focused on the design of the web application. The mock-ups were structured to explore various aspects of the application, including:

a **Text input area:** Participants were presented with two options: one showing separate text boxes for the original and adapted text, and the other one combining both functions into a single box. Participants were asked to indicate which layout they found more intuitive to use.

b **Instruction wording:** Participants were shown two options to choose how the input instructions should be presented. Option 1 showed the instruction *Escribe tu relato debajo o escoge un archivo* clearly displayed above the text input box, framed in a coloured banner. In Option 2 the instruction was integrated directly into the text box as placeholder text: *Escribe o pega aquí tu relato. También puedes escoger un relato con el botón "Escoge un archivo".*

c **Pictogram support:** A sample of adapted text was presented with corresponding pictograms. Participants were asked whether this visual aid helped them understand the text more easily.

d **Text-to-Speech feature:** The possibility of listening to the adapted story through a text-to-speech (TTS) function was introduced, and participants were asked for their opinions on its usefulness and preferred form of activation.

3.2. Participants

A total of 4 participants took part in the co-design session. The group consisted of 2 females and 2 males. Three participants were Spanish nationals, and one was Peruvian. In terms of age, one participant was 21, one was 33, one was 42, and one was aged 43. Regarding disability profiles, two participants had intellectual disabilities, one had a neurological condition, and one had both an intellectual disability and a mental health condition. Reading comprehension levels[7] varied across the group: one participant demonstrated a low level, one a high level, and two reported a medium-high level of comprehension.

We are aware that the main limitation of this co-design session is the small sample size. However, in qualitative research, sample size is not the main concern. As Parahoo [25] points out, while group size matters during planning, it "is not a starting point" in qualitative research. In the context of focus groups, Krueger [26] and Then [27] recommend groups of 6 to 8 participants, but they also recognise that smaller groups can be valid and effective, particularly when working with vulnerable populations. For example, Lane and colleagues [23] describe sessions with only three participants due to logistical barriers, such as caregiving responsibilities or limited support.

4. Implementation of AlicIA user interface

In this section we describe the design implementations of AlicIA user interface based on the feedback provided by the participants. AlicIA is a web- and mobile-based application[8] designed to support the automatic adaptation of short stories in Spanish according to the E2R guidelines, by means of Artificial Intelligence (AI)-based techniques. The application aims to promote inclusive reading practices, especially for users with intellectual or cognitive disabilities. The current version of AlicIA user interface is the result of the feedback gathered in the participatory design process described in Section 3. AlicIA is built around three main functionalities: (a) automatic adaptation of short stories into a format close to the E2R Methodology; (b) visualisation of the adapted texts with pictograms, enabling enhanced comprehension through symbol-based representations, and (c) customisable accessibility settings, including visual adjustments such as font size, letter and line spacing, and high-contrast mode.

[7] This information was provided by the support professional.
[8] The application is not yet available but will be in a few months.

As mentioned in Section 3, the participatory design session was focused on the web version of AlicIA. However, we have also developed a first prototype of the mobile app, following the same design suggestions and accessibility features shared by the participants.

4.1. User interface design and layout

The user interface reflects several suggestions made by the participants during the co-design session. In terms of **visual design**, the participants expressed a preference for a clean background over a gradient version shown in one of the mock-ups, which they found visually distracting. They also suggested simplifying the subtitle under the logo: the original *Relatos accesibles* was replaced by *Aplicación para adaptar relatos*. Furthermore, the welcome message was reformulated in a more friendly tone, becoming *¡Hola, soy Alicia! Te ayudo adaptar relatos*, as shown in Figure 1 for the web user interface and Figure 5a for the mobile user interface.

On **instruction wording**, participants selected Option 2, in which the instruction was integrated directly inside the box with the instruction *Escribe o pega aquí tu relato. También puedes escoger un relato con el botón "Escoge un archivo"* (see Figures 1 and 5a).

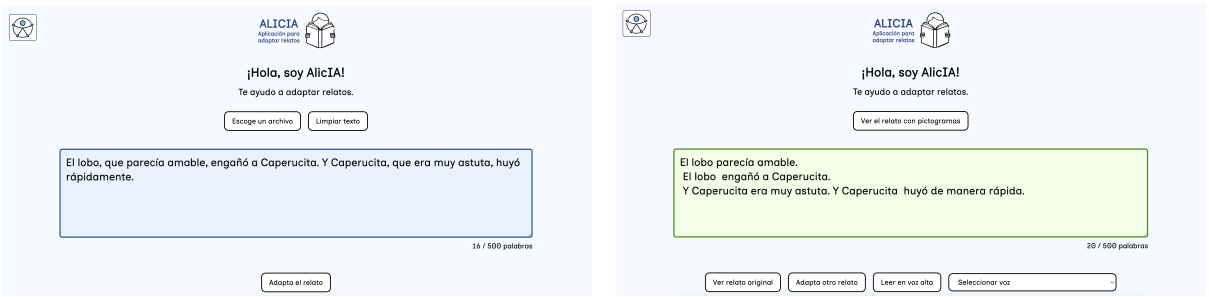
Regarding the **text input area**, participants preferred a single text box for both the original short story and its adapted version. Additionally, participants suggested using colour-coded borders to differentiate the two text areas: blue for the original (see Figure 2a), and green for the adapted version (see Figure 2b), since they claimed that green was intuitively associated with simplicity and ease.

With respect to **buttons and user interface consistency**, in the user interface view where the adapted story is displayed, participants expressed a preference for having the buttons aligned horizontally on the same level and using a unified colour scheme. Some button labels were also revised following feedback: *Cargar relato* was updated to *Escoge un archivo*, while *Ver el relato con pictogramas* and *Adapta otro relato* was retained, as participants found it clear and effective.

Figure 1: General view of the AlicIA user interface.

4.2. Accessibility features

In addition to existing settings for font size and contrast, participants requested controls for adjusting letter and line spacing, which is an important feature for readers with visual processing difficulties. This was implemented following the WCAG 2.2 guidelines [4] by increasing the line height to 1.5 times the font size. Additional spacing controls between characters were also included to ensure legibility with



(a) Original short story. (b) Adapted short story.

Figure 2: Original and adapted versions of a short story in the AlicIA user interface.

enlarged fonts. All these accessibility functionalities are grouped in a collapsible panel located at the top-left corner of the user interface, marked with the international symbol for accessibility. When expanded (see Figure 3 for the web user interface and Figure 5c for the mobile user interface), this panel displays the available options: High Contrast Mode, Increase/Decrease Font Size, Increase/Decrease Line Spacing, Increase/Decrease Letter Spacing, and Reset Settings. This layout enables users to personalise their reading environment while maintaining a clean and distraction-free main user interface. Furthermore, to support users with low literacy or visual impairments, the user interface includes a text-to-speech (TTS) feature (button *Leer en voz alta* in Figure 4) that reads the adapted text aloud, in which users can select among the synthetic voices available on their device. TTS has a potential value of compensatory strategies for individuals with reading difficulties, since this feature helps reduce cognitive load and increase automaticity for struggling readers [28].

Figure 3: Accessibility features in the AlicIA user interface.

4.3. Pictogram view

The participants strongly supported the integration of pictograms as a comprehension aid. Pictograms have already been shown to be effective in the communication of people with cognitive disabilities [29]. In the initial implementation, pictograms were displayed alongside the full adapted text. However, this layout caused visual clutter and made it difficult for users to focus on specific information. Based on the feedback of the participants, the current version of AlicIA presents one sentence at a time, with pictograms illustrating key words in sequence, as shown in Figures 4 (web user interface) and Figure 5b (mobile user interface). This structure reduces cognitive load and fosters a more focused and

semantically coherent reading experience. Technically, AlicIA makes use of the ARASAAC[9] API, in particular, its word-by-word search function, which accurately selects pictograms and reduces visual noise. This strategy is in line with the principles of the so-called pictotranslation[10], where simplified or adapted content is enriched with symbolic representations to reinforce meaning.

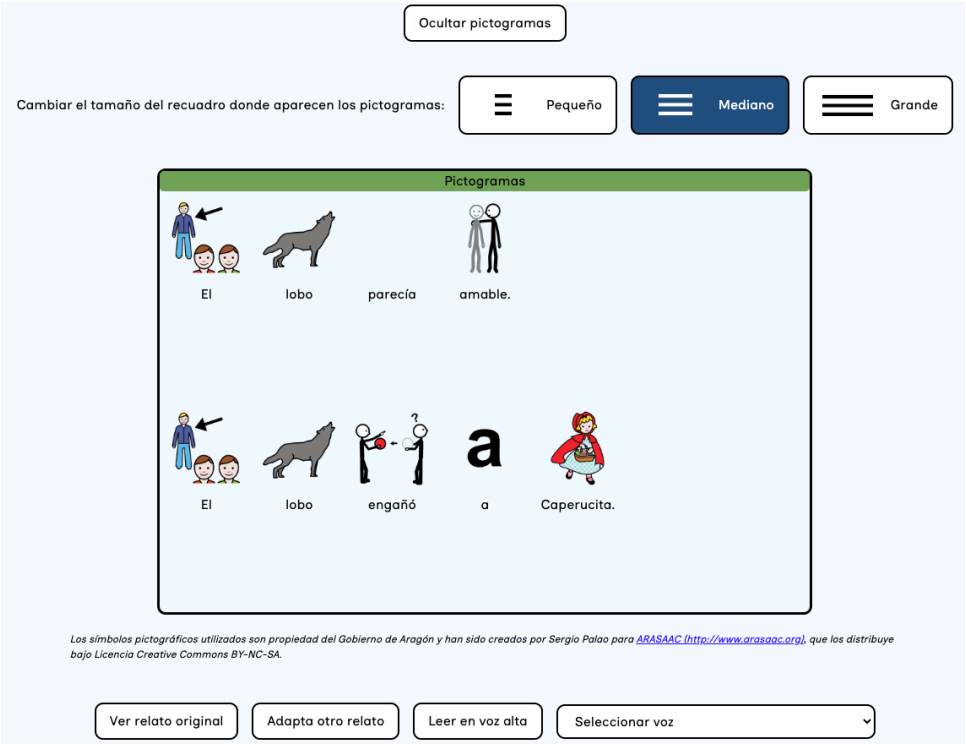


Figure 4: Pictogram view in the AlicIA user interface.

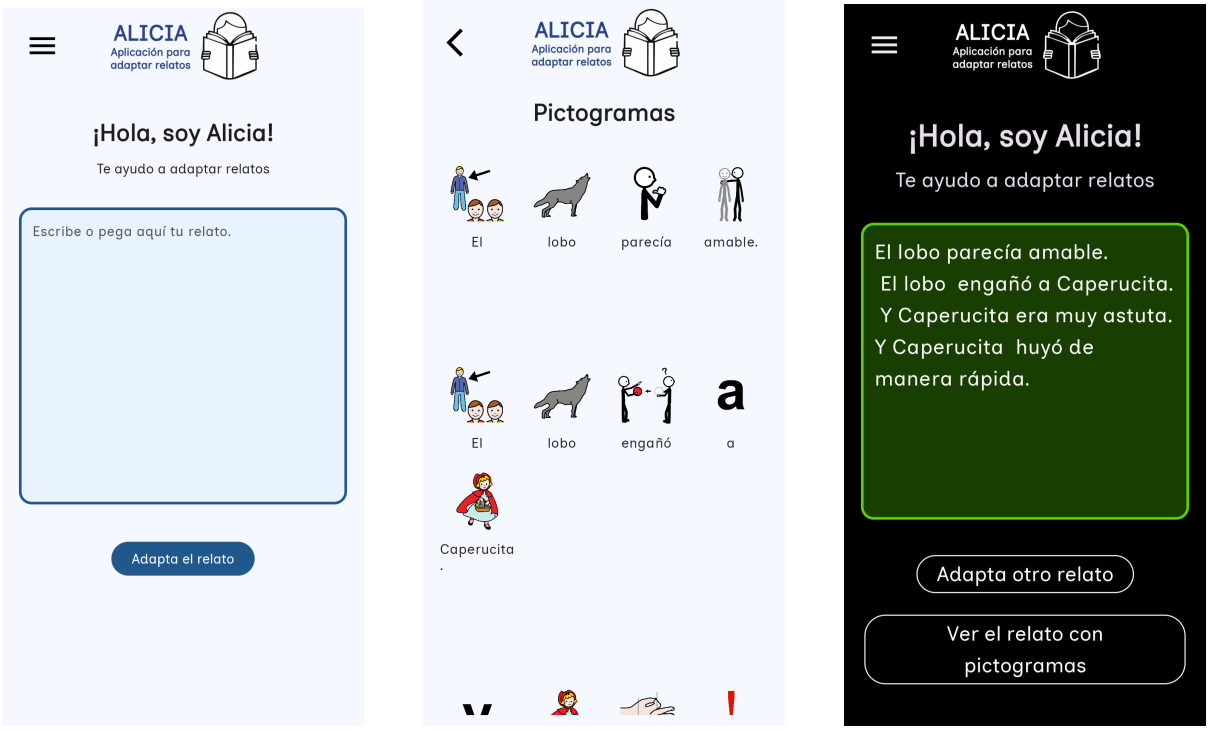
4.4. Error handling

One of the identified needs was to make error alerts visible to users. Previously, when an error occurred, either due to a server failure or incorrect input, there was no clear indication that something had gone wrong, which often led to confusion. To address this, we designed a set of possible error messages and asked the same group of participants, outside the co-design session, to help us. We sent them examples of different error situations, and they gave us suggestions on how the messages should be written. Their feedback helped us adjust the messages to make them easier to understand, as shown in Table 1.

Table 1
Summary of AlicIA error messages

Error Code	Cause	Displayed Message
400, 404, 415	Incorrect data format or headers due to API changes; requires system maintenance.	*Por un problema interno, por favor vuelve a intentarlo más tarde.*
500	Server-side error.	*Por un problema interno, por favor vuelve a intentarlo más tarde.*
200	Unsupported input (e.g., text in another language) or when no suggestions can be generated.	*AlicIA no entiende lo que escribes o no encuentra la respuesta.*

[9]https://arasaac.org/
[10]https://avanzandoconemociones.com/2020/07/29/crear-pictotraduccion/



(a) General view. (b) Pictogram view. (c) Contrast mode.

Figure 5: Screenshots of the AlicIA mobile user interface.

5. Conclusions and future work

In this work we present the co-design of the user interface of AlicIA, a web- and mobile-based application for the automatic adaptation of short stories in Spanish according to the Easy-to-Read Methodology guidelines. A key contribution of this work lies in the integration of a participatory co-design process, in which users with cognitive disabilities actively contributed to the design of the user interface. The participants' feedback provided the basis for the design of the application: from visual design to accessibility features and the display of pictograms. The resulting application demonstrates how collaborative design methods can improve both usability and inclusion in AI-based accessibility technologies. We are aware that this first stage of development involved a single co-design session, focused on the web version of the application and primarily addressing interface-level aspects. Due to time and resource constraints, some components of the system were developed prior to the co-design session, and user participation was limited to a specific phase of the process. In future iterations, we aim to extend user involvement to additional stages of development, including the evaluation and refinement of underlying features, in order to ensure a more comprehensive and participatory design approach.

As future work, we will first validate the mobile version of AlicIA to see if the design feedback from the web version also works well on mobile. After that, we plan to carry out a usability evaluation of both versions, web and mobile, involving more users with cognitive disabilities. Finally, we will consider incorporating cost-of-interaction indicators and extending the reference framework with more recent literature on participatory design and cognitive accessibility.

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Declaration on the Use of AI Tools

During the preparation of this work, the authors used the AI-based tools ChatGPT and Writefull to assist with grammar and spelling checks. The authors have reviewed and edited the content as needed and assume full responsibility for the accuracy and integrity of the final manuscript.

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