Video-blogs and linguistic simplification for students with intellectual disability

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Abstract

Background: The Internet provides individuals with intellectual disability with access to information and participation in a broader society, but it also presents risks when content is difficult to comprehend. This study aimed to test whether students with intellectual disability enhanced their comprehension of online blogs as a function of the format (text vs. video) and linguistic simplification.

Method: Young students with intellectual disability read or watched text and video-blog posts about environment, health, society, and technology in their original version or a linguistically simplified/easy-to-read version. Then, they completed tests that assessed their reading processing (e.g., calibration) and comprehension of blog content.

Results: Participants predicted that they would correctly answer 80% of the comprehension questions, but their average comprehension of the blog posts was 55%, regardless of the condition. Previous levels of students’ reading comprehension skills predicted their blog comprehension scores and interacted with format and simplification. Those participants with higher reading comprehension skills learned more from non-simplified than from simplified blog posts while those with lower levels of reading comprehension skills did not benefit from linguistic simplification nor video-blog format although the difference with regard to higher comprehenders was lower in the video and simplified conditions.

Conclusions: Improving reading comprehension abilities of students with intellectual disability is essential to prevent the digital divide while linguistic simplification is not a useful accommodation and even counterproductive for higher reading comprehenders.

Keywords
intelligent disability, linguistic simplification, monitoring, reading, video-blogs

1 | INTRODUCTION

The healthcare emergency caused by the COVID-19 pandemic has accelerated the digitalization of education. Consequently, now more than ever, the Internet has become a primary interaction window between information, teachers, and learners. However, not all Internet users are equally equipped with digital resources and skills across the lifespan (Eynon, 2021). This is the case of adolescents and young adults with
intellectual disability, who are frequent users of digital media (Chadwick & Fullwood, 2017; Chiner et al., 2016) despite their low level of advanced skills in using them (Delgado et al., 2019; Salmerón et al., 2016). This combination may give rise to risks such as giving credence to false information, being exposed to manipulative content, performing illegal downloads or sharing and receiving inappropriate or unwanted sexual content (Gómez-Puerta & Chiner, 2021). The risks can be exacerbated by the fact that some other basic skills required to learn from digital content, such as reading competence (decoding, comprehension, and meta-comprehension), cannot be taken for granted in learners with intellectual disability.

The fast development of online video technology, especially in the educational context, can have a strong potential to support online learners who have low-reading skills. However, to the best of our knowledge, its efficiency for young students with intellectual disability has not been assessed. Therefore, the goal of the present study was to examine whether comprehension of video-blog posts was better than the comprehension of text-blog posts in young online learners with intellectual disability. In addition, the contribution of linguistic simplification of the blog posts was examined. In the next section, we present the rationale for our study.

### 1.1 Young online learners with intellectual disability

The present study focuses on young learners with borderline to mild intellectual disability (between 18 and 30 years old) who are autonomous in many ways (depending on each country’s laws, they can drive, vote, get married, etc.) but still need some degree of educational and vocational training to enter the labor market. In this regard, a step forward in the autonomy and self-advocacy of young adults with intellectual disability is to provide them with support in acquiring traditional and digital literacies.

Regarding traditional literacy, children and adults with intellectual disability frequently show poor decoding and reading comprehension skills. In particular, Fajardo et al. (2014) observed that young students with intellectual disability (ranging from 16 to 22 years old) enrolled in special vocational training programs, showed reading comprehension levels equivalent to typically developing students in Grades 2–3 (7–9 years old) and a vocabulary level comparable to 9-year-old children. Instructional research has identified ways to overcome low reading comprehension skills: (1) direct training in vocabulary, grammar, or comprehension strategies, for example, by means of reciprocal teaching (Hovland, 2020; Van den Bos et al., 2007); (2) using simplified texts adapted to their reading skills (Fajardo et al., 2014); or (3) a combination of both (e.g., Lundberg & Reichenberg, 2013).

Because direct training and support are highly demanding in terms of human resources and time, they cannot be implemented as fast as the information is generated in some contexts (especially online information such as digital newspapers or online blogs). Therefore, the use of simplified texts has become a key measure adopted by associations of people with intellectual disability to facilitate their access to educational content, legal documents, or health information (e.g., Inclusion Europe, Europe; Plena Inclusión, Spain). In a broad sense, text simplification can be defined as the process through which text difficulty is reduced and adapted to the reader’s abilities. Its purpose is to provide the reader with a text that is more comprehensible and accessible than the original version, or in other words, less difficult to understand (Crossley et al., 2012; Fajardo et al., 2013). The terms ‘Text simplification’, ‘linguistic simplification’, design of ‘Easy-to-read texts’, or ‘plain language texts’ are used interchangeably to refer to the activity of simplifying, adapting, elaborating or creating texts that match the readers’ level. The differences among these terms are related to the type of features they consider as the target of simplification, which range from the use of illustrations or orthotypography issues (e.g., round or italic font) to the adaptation of linguistic features of the texts (e.g., sentence length or word frequency) (for a discussion see Arfé et al., 2018). In this article, we focus just on the adaptation of linguistic features of the texts (e.g., control of sentence length, word familiarity, or use of connectives) that can affect, both written and oral language. Organisations like Inclusion Europe usually recommend the use of sets of guidelines for linguistic simplification, such as ‘Use active language rather than passive language’ and ‘Do not use difficult ideas such as metaphors’ (Inclusion Europe’s guidelines, Freyhoff et al., 1998, or International Federation of Library Associations-IFLA’s guidelines, Nomura et al., 2010). These sets of guidelines are mainly based on inferences from linguistic models and expert consensus, whereas empirical evidence supporting them is scarce but promising. For example, Karreman et al. (2007) tested the reading comprehension level of adults with intellectual disability (the mean age was 37 years) after reading two different versions of a website: one version was adapted following Inclusion Europe’s easy-to-read guidelines (Freyhoff et al., 1998) and the another one was actually the original or non-adapted version of the website. They found that the content comprehension of the participants with intellectual disability was higher on the adapted version than on the non-adapted version. Similarly, Fajardo et al. (2014) asked students with mild intellectual disability (mean age 19 years) and with low levels of reading comprehension skills to read easy-to-read journalistic texts (following IFLA’s guidelines). After reading, the students were asked to complete a set of questions to assess their reading comprehension of the texts. Results showed that participants correctly answered an average of 80% of the comprehension questions, a higher percentage than expected given their low reading comprehension skills.

Most of the research on text simplification has focused on text-based materials, and because of that, it is not clear to what extent the use of simplified language could be generalised to other language modalities, such as oral information provided by videos. This is one of the questions we will try to answer in this research involving population with intellectual disability.

With regard to digital literacy, previous studies have shown that individuals with intellectual disability tend to use the Internet for a variety of purposes, such as listening to music, watching videos for fun and learning, chatting with friends, or interacting on social networks (Chiner et al., 2017; Delgado et al., 2018, 2019). In fact, the use of video modelling in the educational context is increasing when teaching, for instance, employment skills to people with intellectual disability.
(Park et al., 2020). However, it has also been observed that, despite being high Internet consumers, people with intellectual disability usually lack digital literacy competencies such as evaluating recommendations from Internet forums (Salmerón et al., 2019) or selecting relevant results from search engine results (Salmerón et al., 2016).

In sum, young learners with intellectual disability could potentially benefit from the use of online resources in their vocational training programs, especially when they are supported by linguistic simplifications of the content (easy-to-read texts) and less dependence on reading, for example, by using video recordings or audio podcasts. However, these choices may also come with risks, as observed in learners with typical development.

1.2 Learning from online blog posts: Text versus video

Several authors have argued that in comparison with face-to-face and print learning, learning on digital media might lead to shallower comprehension, especially in video format (Annisette & Lafreniere, 2017; Salmerón et al., 2020). The so-called ‘shallowing hypothesis’ (Annisette & Lafreniere, 2017) suggests that because most of users’ interactions with digital media consist of quick episodes driven by immediate rewards, learners process information in a superficial way, which hinders the process of constructing a coherent representation of the message displayed. In turn, given that most students tend to use streaming videos for entertainment purposes, Internet videos might also be processed in a shallow way. However, because students more regularly use texts for learning at school, it could be inferred that shallow processing would be less pronounced on text-based web pages than on video-based web pages. Supporting this view, Salmerón et al. (2020) found that primary students (mean age 10.5 years) who learned from two text-based webpages included almost twice as many inferences in their responses as those who learned from two video webpages. They also observed that all the students in their sample reported using Internet videos for leisure purposes, but less frequently for learning purposes, which was interpreted as indicating that they may have approached the video learning task in a shallow mode.

Salmerón et al.’s (2020) findings contrasted with previous research by List (2018), who found no differences in information integration between a multiple text condition and a multiple video condition in a sample of undergraduate students with typical development. Salmerón et al. (2020) argued that because older students (as in the case of the undergraduate students from List (2018) have numerous opportunities to learn from Internet videos during high school, this experience may have increased their awareness of the need to actively approach learning tasks through this medium. Thus, they would apply more efficient regulation strategies to better align the actual difficulty of the information conveyed in videos with the time devoted to studying them. This interpretation and the results of List (2018) would agree with the results of a subsequent study conducted by the research team of Salmerón (Delgado et al., 2021) which revealed that the effect of blog format (video or text) was not significant regarding comprehension accuracy for secondary students (9th and 10th grade).

To our knowledge, the effect of the presentation format of digital blog posts (video-blog vs. text-blog) has not been tested in young adults with intellectual disability. Because they are adults and still enrolled in educational programs, we could expect that their behaviour would be more similar to that of the undergraduate students in List (2018). Therefore, no differences should be found between video- and text-blog post learning. However, young adults with intellectual disability also show low reading comprehension skills, which might produce a bottleneck effect on learning from text. Thus, as video-blogs comprehension would not depend on reading, it is reasonable to expect that video-blogs would prevent this bottleneck effect to happen. This would benefit the comprehension of video-blogs versus text-blogs. Alternatively, they may also lack digital competencies because caregivers and educators tend to overprotect them (Gómez-Puerta & Chiner, 2021), compromising their autonomy and self-regulation behaviour in digital media in general.

Therefore, the aim of the study was to analyse the effect of the presentation format of digital blog posts (video-blog vs. text-blog) and linguistic simplification (simplified vs. non-simplified) on comprehension accuracy in young students with intellectual disability. Our specific hypotheses were:

H1. Given that the decoding and reading comprehension skills of our participants are poor, we expect to find a facilitative effect of linguistic simplification on comprehension accuracy; that is, comprehension will be higher on simplified blogs than on non-simplified blogs, regardless of the presentation format.

H2. Given that the video format reduces the need for decoding skills, we expect to find a facilitative effect of the video format on comprehension accuracy because more cognitive resources are available for comprehension; that is, comprehension will be higher on video-blogs than on text blogs, regardless of the linguistic simplification condition.

In an exploratory way, we will also analyse the influence of participants’ prior reading-related skills (word decoding and text comprehension), interest in the topic, prediction of performance (as related to self-monitoring), and content comprehensibility on blog comprehension, given that all these variables have been linked to learning from texts in populations with typical development (e.g., Macedo-Rouet et al., 2013; Prinz et al., 2020).

2 METHOD

2.1 Participants

Sixteen young students with intellectual disability were recruited to participate. They were enrolled in a special vocational training program for young people with intellectual disability held at the
University of Valencia (Spain) where two of the co-authors of this study worked as teachers. Participants were informed about the study and were invited to take part in it. If they agreed, they signed the informed consent before starting the study. The inclusion criterion was that participants had to present borderline to moderate intellectual disability, measured by the nonverbal test of intelligence from the Spanish version of Kaufman Brief Intelligence Test (K-BIT, Kaufman & Kaufman, 1997) which has been standardised with Spanish sample. Two participants were excluded because their non-verbal Intelligence Quotient (IQ) was within the normal range. The average IQ scores and chronological ages of the remaining 14 participants were 72.5 (SD = 5.4, range = 67–86, corresponding to borderline to mild intellectual disability) and 24.06 years (SD = 3.25; range = 18–29), respectively.

To establish the level of reading-related skills, participants were asked to complete a series of additional standardised tests that are widely used in Spain and standardised with Spanish population. Word decoding and reading comprehension skills were assessed by means of two subtests of the battery for the evaluation of reading processes (PROLEC-R, Cuetos et al., 2014). Averaged decoding skills, a compound index of word and non-words reading accuracy and speed, were 78.81 (SD = 22.27) for words and 48.67 (SD = 18.56) for non-words. These scores correspond to 1 SD below the mean score for 6th graders (11–12 years old). Their average raw score on the reading comprehension skill was 8.71 (SD = 3.57; range = 2–14), which was again 1 SD below the mean score for 6th graders. That is, on average, participants were at least 6 years below their chronological age in word decoding and reading comprehension skills.

The study was carried out in accordance with the principles of the Declaration of Helsinki and was approved by the Ethics Committee of the University of Valencia (H1443008998347).

2.2 | Design, task and materials

2.2.1 | Design

For the experimental task (digital blog learning task), we used a repeated-measures design with presentation format (video-blog vs. text-blog) and linguistic simplification (original vs. simplified, also called ‘easy-to-read’ format) as within-subject factors. Therefore, each participant performed the experimental task in four conditions: simplified video-blog post, non-simplified video-blog post, simplified text-blog post, and non-simplified text-blog post.

2.2.2 | Digital blog learning task

Participants were asked to read textual blog posts or watch video blog posts about environment, health, society and technology in their original version or in a linguistically simplified version. After reading or watching each blog post, they were asked to answer comprehension questions (see Figure 1 for examples of textual blog post and video-blog post).

2.2.3 | Materials

The learning materials (generically called ‘items’ here) consisted of eight documents presented as blog posts with an expository structure related to four thematic areas: environment (e.g., global warming), health (e.g., diets), society (e.g., feminism) and technology (e.g., ebooks). The interest of the learning materials was piloted with an independent group of 11 individuals with intellectual disabilities.

FIGURE 1 Examples of textual blog post (left) and video blog post (right) used in the study. These two examples correspond to the practice trials that participants had to complete before the experimental trials.
from a similar vocational training program. Participants who participated in the pilot phase, were asked to rate from a list of 18 topics how interested they were on each one by using a 10-point Likert scale from 0 (‘I’m not interested at all’) to 10 (‘I’m very interested’) (see the original questionnaire in Spanish in Supporting information S1). We selected the eight topics that obtained a higher interest score (median score = 9.1). Each document started with the self-presentation of the blogger, followed by the presentation of three to four main ideas, and ending with a concluding remark. The length of the documents varied between 364 and 565 words, or 01:19 and 03:43 s (see more details in Table 1).

Each document was implemented in four versions: simplified video-blog post, non-simplified video-blog post, simplified text-blog post, and non-simplified text-blog post. Each post’s content was created by the authors of the present study and adjusted to the linguistic and reading level of typical secondary school students. Then, the contents were linguistically simplified following the guidelines for designing easy-to-read materials from the International Federation of Library Associations and Institutions (Nomura et al., 2010) and the Spanish recommendations for the validation of easy-to-read documents (UNE 153101:2018 EX). In the video versions, the contents (either simplified or not) were presented by a person who, sitting in front of the camera, told the discourse in the text format verbatim. The video backgrounds were neutral and had only a few objects in the scene (e.g., a book or a plant). No animations, images, or music were added to any of the blog posts. In addition, two practice items were designed: one video-blog post and one text blog post (see examples of both format in Figure 1).

In order to control for a confounding effect between the explanatory variables (blog format and simplification) and the order of presentation of items, we created four blocks that included eight experimental items and two practice items each. The blocks varied in order of presentation of the experimental items, whereas the order of the practice items was fixed (the text-blog post was presented first, and then the video-blog post). Each participant randomly received one of the four blocks. The assignment of each of the eight documents created to the experimental condition in each block was counterbalanced and sequenced in such a way that the documents were not repeated, video and text blog posts were alternated, and no more than two simplified items and two non-simplified items were presented consecutively. Thus, each participant read two simplified text blogs, two non-simplified text blogs, two simplified video-blogs, and two non-simplified video-blogs. For example, as it can be seen in Table 1 and Figure 2, participants who were assigned to Block 1 were presented with the eight experimental items (two per each one of the four conditions) in the following order: climate change (text, non-simplified), mobile phones (video, simplified), cultural identity (text, simplified), nuclear waste (video, non-simplified), vegetarian diet (text, simplified), feminism (video, non-simplified), eBooks (text, non-simplified) and social networks (video, simplified). Participants who were assigned to Block 4, however, were presented with the eight experimental items in the following order: mobile phones (text, simplified), eBooks (video, non-simplified), nuclear waste (text, non-simplified),

| Block 1 | Block 2 | Block 3 | Block 4 |
|---------|---------|---------|---------|
| Order/format | Order/format | Order/format | Order/format |
| Text | Video | Text | Video |
| 1 | 2 | 3 | 4 |

**Note:** Each participant was randomly assigned to one of four blocks.

**TABLE 1** Learning materials formal details and order of presentation according to blocks

| Thematic area | Abbreviated title | Linguistic simplification | Duration of the video | Word count | Words per phrase | Legibility index (μ) | Word count | Paragraphs | Order/format |
|---------------|-------------------|---------------------------|-----------------------|------------|-----------------|----------------------|------------|------------|--------------|
| Environment   | Nuclear waste     | Non-simplified            | 2:05'                 | 393        | 5               | Difficult            | 4         | 2          | Video        |
| Environment   | Climate change    | Non-simplified            | 2:07'                 | 401        | 34              | A bit difficult      | 6         | 1          | Text         |
| Environment   | Climate change    | Simplified                | 2:56'                 | 397        | 17              | Adequate             | 5         | 3          | Text         |
| Health        | Vegetarian diet   | Simplified                | 3:41'                 | 516        | 12              | Adequate             | 4         | 4          | Video        |
| Health        | Mobile phones     | Simplified                | 3:06'                 | 409        | 11              | Adequate             | 3         | 5          | Video        |
| Health        | Social networks   | Simplified                | 3:43'                 | 548        | 14              | Adequate             | 3         | 5          | Video        |

**Note:** Each participant was randomly assigned to one of four blocks.
vegetarian diet (video, simplified), feminism (text, non-simplified), cultural identity (video, simplified), social networks (text, simplified) and climate change (video, non-simplified).

2.2.4 | Measures

Comprehensibility (ease of processing)
Comprehensibility is a subjective measure of how easy a text is for readers to comprehend (e.g., Maki et al., 1990). See details of questions and procedure in Table 2.

Predictions of performance (POP)
Participants were asked to indicate how confident they were about responding correctly to the questions about the information they had just read/listened to (adapted from Ackerman & Lauterman, 2012).

Comprehension questions
Participants were asked to answer questions that covered the main ideas of the blog post’s content. The same questions were used for the simplified and non-simplified versions of the items, and they were in linguistically simplified format. We elaborated three literal questions and three inferential questions per blog post (Ozuru et al., 2013). However, because the linguistically simplified versions were so explicit (e.g., no pronouns but repeated name co-references, definitions of difficult words, etc.), it was not always possible to design inferential questions. Therefore, we did not distinguish between the two types of questions for the analysis, but we just controlled for the number of questions of each type per text. Texts and videos appeared again after the comprehension questions, and participants were instructed to re-read or re-watch them if necessary to answer the comprehension questions. Participants’ actions over the texts and videos in this part of the study were not registered. Finally, comprehension questions were piloted in a study conducted with a different sample of young students with intellectual disability (Fajardo et al., 2019). The students (16 in total) who participated in the pilot study were asked to read/listen to the information and answer the comprehension questions for six out of the eight learning materials. Afterwards, we conducted an items reliability analysis and the Cronbach alpha value was high (0.837). In order to ensure that six learning materials were equivalent in difficulty, we performed an item difficulty analysis by calculating the percentage of correct answers per questions and learning materials. For those learning materials that resulted too easy or too difficult, some questions were re-formulated to make them similar to the rests of texts. As we needed at least eight different learning materials in order to have two items per experimental condition in our study, we added two more learning materials from a similar study piloted with a group of secondary school students with typical development (Delgado et al., 2021). On average, simplified texts were classified from ‘normal’ to ‘quite easy’ according to the Spanish legibility formula of Muñoz and Muñoz (2006) and had more sentences and paragraphs but fewer words per sentence than the original texts for secondary students which were classified from ‘a bit difficult’ to ‘quite difficult’ (for details, see Supporting information S1).

Interest
Topic interest was defined as a disposition towards the topic and a tendency to engage with the topic (Hidi & Renninger, 2006).

2.2.5 | Procedure
The study was performed in two phases. First, participants filled out the set of standardised tests of non-verbal intelligence and reading-related skills. They were administered in individual and onsite sessions (at the school) during the first semester of the participants’ vocational
training course by one the authors of the study. The second phase consisted of two experimental sessions conducted during the second semester of the academic course. This phase was supposed to be carried out onsite as well, but because students were confined at home due to the COVID-19 health emergency in Spain, it was finally conducted online. The eight items in each experimental block (see again Figure 2 for an example of item presentation order for Block 1) were divided into two parts, so that four items were presented in each experimental session. Each participant performed the sessions on two consecutive days in June 2020. For each session, participants were given an appointment and received a video call through their computers from an evaluator (one of their teachers in the vocational training course) who was trained in the experimental procedure. The evaluator explained the instructions orally and asked participants to maintain the video call active during the session and share their screens with him/her. The participants could be aided by parents at home in following the experimental procedure. Then, the participants received a link to start the study online. They first read and signed the written consent, and then they performed the practice trials, guided by the evaluator.

Participants were instructed to ask questions, if necessary, until the procedure was clear. After the practice trials, they started the four experimental trials, each of which consisted of reading or watching the content and answering the comprehensibility question, the POP question, the comprehension questions, and the interest question, in that order. Each session lasted about 40 min. Participants were instructed to report any Internet connection problems that kept them from following the procedure. The evaluator was present (online) and monitored the sessions, ensuring that participants were performing the task alone and without interruptions, but he was told not to help

### TABLE 2
Flow chart of the experimental procedure and question and answer format details for each measure used in the study.

| Flow chart | Task/measure | Question | Scale/options | When |
|------------|--------------|----------|---------------|------|
| 1          | Read/watch the blog with learning material | How comprehensible was the content for you? | Not at all (0), Not much (1), Something (2), Quite (3), A lot (4) | After reading/listening to each blog post |
| 2          | Comprehensibility | How many questions out of 6 do you expect to answer correctly? | 1 to 6 | After the comprehensibility question |
| 3          | Predictions of performance (POP) | | |
| 4          | Comprehension questions | Six multiple choice questions | Three response options | After the POP question |
| 5          | Interest | How interested were you in the text/video you read/watched? | Not at all (0), A little (1), Somewhat (2), Quite (3), Very (4) | After the comprehension questions |

Note: This flow chart was repeated for each one of the eight experimental blogs.

### TABLE 3
Means (standard deviation) for comprehension accuracy, prediction of performance, comprehensibility and interest as a function of blog format and linguistic simplification

| Linguistic simplification | Blog format | Comprehension accuracy (%) | Prediction of performance (%) | Comprehensibility | Interest |
|---------------------------|-------------|-----------------------------|------------------------------|------------------|----------|
|                           |             | Mean (SD)                   | Mean (SD)                    | Mean (SD)        | Mean (SD) |
| Simplified Video          | 56.55       | 24.15                       | 79.17                        | 3.36             | 3.47     |
| Non-simplified Video      | 51.19       | 22.18                       | 77.98                        | 3.29             | 3.18     |
| Simplified Text           | 55.35       | 27.61                       | 83.93                        | 3.36             | 3.25     |
| Non-simplified Text       | 54.76       | 25.6                        | 78.04                        | 3.18             | 3.21     |
| Total                     | 54.46       | 24.89                       | 79.77                        | 3.30             | 3.28     |

Pearson Zero-order correlations between measures

| Variable                  | 1     | 2     | 3     | 4     | 5     | 6     |
|---------------------------|------|------|------|------|------|------|
| 1. Prediction of Performance | -    |      |      |      |      |      |
| 2. Comprehensibility      | .77**| -    |      |      |      |      |
| 3. Interest               | .35  | .58* | -    |      |      |      |
| 4. Word reading           | -.51 | -.40 | .077 | -    |      |      |
| 5. Non-word reading       | .155 | .22  | .407 | .55* | -    |      |
| 6. Reading comprehension skills | .177 | .42  | .61* | .02  | .40  | -    |

*p < .05; **p < .01 (unilateral).
the students answer the comprehension questions or answer vocabulary or other questions related to the blog posts’ content.

3 | RESULTS

Table 3 shows the descriptive statistics for comprehension accuracy (percentage), prediction of performance (percentage), comprehensibility, and interest as a function of blog format and linguistic simplification. As can be observed, participants with intellectual disability overestimated their learning from the blog posts because their prediction of performance was 80% on average, 25% higher than their actual comprehension accuracy (around 55% of correct answers). They also reported that the contents were quite easy to comprehend (average of 3.3, ranging from 0—very difficult to 4—very easy to comprehend) and interesting (average of 3.28, ranging from 0 to 4).

Table 3 also shows the Pearson zero-order correlations between measured variables (prediction of performance, comprehensibility, and interest, decoding and reading comprehension skills of participants).

3.1 | Effects of linguistic simplification and blog format on comprehension accuracy

To test H1 and H2, we conducted several generalised linear mixed effects models (GLMMs) using the lmer in R (R Core Team, 2020). The ‘summary’ function and the ‘effectsize:standardize_parameters’ function were used to obtain estimates, z and p values and effect sizes (standardised beta coefficients—β), respectively. The categorical fixed factors were Blog-post format (Text vs. Video) and Linguistic simplification (Simplified vs. Non-simplified). Effect coding (0.5, −0.5) was used to contrast categorical fixed effects. Participants and Topic (environment, health, society, and technology) were introduced as random intercepts in the model. The dependent variable was comprehension accuracy, operationalised as the percentage of correct answers on the experimental learning task. Although we did not make specific predictions about individual differences, we also wanted to explore the effect of students’ previous level of decoding (word and non-word reading) and comprehension skills on blog reading comprehension, and so we conducted a GLMM with the above structure for each reading-related variable introduced as a continuous fixed factor in our model, that is, we conducted three GLMMs in total. The generic formula in R was:

glimer (comprehension_accuracy ~ format × simplification × centered_continuous_variable + (1/subject) + (1/topic), data)

As measures of decoding and reading comprehension levels, we used the compound index of word and non-word reading and the raw score on the reading comprehension subtest of the PROLEC-R test (Cueto et al., 2014), respectively. Both measures were centered before the analysis to improve the interpretability of the results (e.g., Schielzeth, 2010). Given that the complete model with fixed and interactions terms did not converge for decoding skills, we removed the interaction terms between decoding skills and blog format and decoding skills and linguistic simplification because the a priori estimates were lower than the rest of the factors. We report the results that correspond to this last converging model (more details for converging models and analyses are reported in Supporting information S1 and also can be requested to the first author of this article).

Contrary to H1and H2, neither the main effects of blog format ($z = 0.318, p = .751$) and linguistic simplification ($z = 0.925, p = .355$) nor the interaction between blog format and linguistic simplification ($z = 1.444, p = .149$) were significant for comprehension accuracy. As descriptive results in Table 3, comprehension accuracy was similar across conditions, with around 55% of correct answers, so that neither the facilitative effects of the video format nor linguistic simplification were supported by our data. However, although students’ comprehension was low on average (55%), their accuracy was above chance levels (33% for multiple choice questions with three response options).

3.2 | Effects of decoding and reading comprehension skills on comprehension accuracy

The main effects of word decoding skills ($z = 0.785, p = .433$) and non-word decoding skills ($z = 1.237, p = .216$) on blog comprehension accuracy were not reliable. Regarding reading comprehension skill, the results showed that the main effect of this variable on blog comprehension accuracy was significant ($β = 0.2; z = 5.367, p < .001$) as well as the interactions of this variable with blog format ($β = 0.07; z = 2.781, p = .005$) and with linguistic simplification ($β = 0.9, z = 3.513, p < .001$). However, the tree-way interaction between reading comprehension skills, blog format and linguistic simplification was not significant ($z = −0.002, p = .999$).

As can be seen in Figure 3, the main effect of reading comprehension skills suggests that the higher the participants’ reading comprehension skills, the higher the comprehension accuracy on learning from blogs. The standardised effect size ($β = 0.20$), a medium effect size according to Acock (2014), indicates that for each standard deviation increment in participants’ prior reading comprehension skills, there was a 20% increment in comprehension accuracy on the digital blog learning task.

However, reading comprehension skills interacted with blog format and linguistic simplification independently, so in order to analyse the simple effects of these interactions in an easier way, we transformed reading comprehension skills into a categorical measure by splitting participants into two groups as a function of their centered direct scored in this variable: those participants who scored higher than zero were considered ‘higher comprehenders’ ($M_{raw\ score} = 11.71, SD_{raw\ score} = 1.5$, which is within the normal range for 6th graders) while those participants who scored higher than zero where considered ‘lower comprehenders’ ($M_{raw\ score} = 5.71, SD_{raw\ score} = 2.27$, which is two standard deviations below the mean score for 6th graders).
We then conducted two new GLMMs introducing reading comprehension skills as a categorical fixed factor instead of continuous fixed factor and linguistic simplification or blog format as the second fixed factor. Regarding the interaction with linguistic simplification (see Figure 4 left), the results showed that higher comprehenders learned significantly more from blogs when content were not linguistically simplified than when they were simplified ($z$-ratio = 2.833; $p = .024$) while lower comprehenders did not seem to benefit from linguistic simplification ($z$-ratio = −2.546; $p = .053$) although the difference between higher and lower comprehenders in comprehension accuracy was lower in the simplified condition ($z$-ratio = 2.265; $p = .1062$) than in the non-simplified condition ($z$-ratio = 3.774; $p = .0009$). That is, the linguistic simplified version of blogs seemed to reduce the lag between higher and lower reading comprehenders.

With regard to the interaction with blog format (see Figure 4 right), neither higher nor lower comprehenders benefited from video-blogs in comparison to text-blogs ($z$-ratio$_{lower} = 1.924$; $p = .218$; $z$-ratio$_{higher} = −0.945$; $p = .781$) although the difference between
higher and lower comprehenders in comprehension accuracy was lower when learning with video-blogs (z.ratio = 2.494; p = .061) than when learning with text-blogs (z.ratio = 3.504; p = .003). That is, video format seemed to reduce the lag between higher and lower reading comprehenders.

3.3 Prediction of performance, interest, and comprehensibility

With the aim of exploring the relationship between linguistic simplification, the blog format, and the prediction of performance, interest, and comprehensibility, we conducted a new GLMM for each additional measure as dependent variable. Again, the categorical fixed factors were blog format (text vs. video) and linguistic simplification (simplified vs. non-simplified). Effect coding was used to contrast the categorical fixed effects. Participants and topic (environment, health, society, and technology) were introduced as random intercepts in the model.

As can be seen in the descriptive data in Table 3, in general, participants considered the content they read or watched to be very interesting and comprehensible, and they predicted a higher number of correct answers (around 4.8 correct answers out of 6) than the number they finally got on the questions (3.6 correct answers). However, there were no main effects of linguistic simplification or blog format on comprehensibility (simplification, $z = -0.366$, $p = .751$; format, $z = -0.159$, $p = .874$), interest (simplification, $z = -0.465$, $p = .642$; format, $z = -0.252$, $p = .801$) or prediction of performance (simplification, $z = -0.075$, $p = .940$; format, $z = 1.388$, $p = .165$).

The interaction between linguistic simplification and blog format was neither significant for comprehensibility ($z = -0.159$, $p = .874$), interest ($z = 0.359$, $p = .720$) nor prediction of performance ($z = -1.352$, $p = .176$).

4 DISCUSSION AND CONCLUSIONS

The widespread use of video-based applications in today’s education can have strong potential to support online learners with low reading skills, but their efficiency for young students with intellectual disability has not previously been tested. Therefore, the goal of the present study was to examine whether video-blog posts, compared to text-blog posts, facilitated online learning in young people with intellectual disability. In addition, the contribution of linguistic simplification of the blog posts was examined.

In summary, our results showed that participants overestimated their accuracy on learning from blog since they predicted that they would correctly answer 80% of the comprehension questions, but their average comprehension of the blog posts was 55%, regardless of the condition. With regard to prediction of performance, interest, and comprehensibility, our results showed that they correlated with each other, but they did not vary depending on the blog format or linguistic simplification. Finally, the most interesting findings were that previous levels of students’ reading comprehension abilities predicted significantly their comprehension scores and interacted with blog format and linguistic simplification. On the one hand, those participants with intellectual disability and higher reading comprehension skills learned more from non-simplified blog posts than from simplified versions while blog format did not affect them. On the other hand, those participants with lower levels of reading comprehension skills did not benefit from linguistic simplification nor video-blog format. Further post hoc analysis of these interactions also revealed that the difference between lower and higher comprehenders was lower in the video blog condition than in the text blog condition and in the simplified blog condition than in the non-simplified blog condition. However, as it was observed in Figure 4, the reduction of differences between higher and lower comprehenders appeared not only because lower comprehenders increased slightly their performance in video and simplified blogs (highly desirable) but mainly because higher comprehenders reduced it (not that desirable and controversial as we will discuss later).

Regarding the influence of blog format on comprehension accuracy, we could say that, in light of our results, young adults with intellectual disability benefit equally from learning through text-blog posts and video-blog posts. This result contrasts with the negative effect of video on learning reported by Salmerón et al. (2020) in children, but they are in line with the absence of a media effect on comprehension reported by List (2018) with undergraduates and by Delgado et al. (2021) with secondary students. Thus, we can elucidate that older students with intellectual disability probably have enough experience with watching videos for learning, which would allow them to develop efficient regulation strategies, as in text reading. In fact, as previous studies have shown, individuals with intellectual disability report to watch videos for learning and for fun more frequently than other text-based activities like reading news (Alfredsson Ågren et al., 2020; Delgado et al., 2019).

With regard to the influence of linguistic simplification on comprehension accuracy, we found that neither the main effect of linguistic simplification nor its interaction with blog format were significant. Comprehension accuracy was around 55%, regardless of whether the blog posts were simplified or not. It is not surprising that reading comprehension skills predict not only comprehension accuracy in textual blogs but also in video-blogs where there is not written but oral information. The reason could be that the cognitive processes involved in processing both blog formats are very similar as the Simple View of Reading model suggests (Gough & Tunmer, 1986; Oakhill & Yull, 1996): in order to comprehend written or oral discourses, students need to use their syntactic knowledge and high-level inferential skills such as connect ideas from different sentences and with previous knowledge. The differences between oral and reading comprehension will be mainly related to decoding processes which are not present in oral discourse comprehension.

However, the lack of effect of linguistic simplification on text comprehension contrasts again with previous findings that found higher comprehension scores on simplified texts than on non-simplified texts (Fajardo et al., 2014; Karreman et al., 2007).
Differences in the pattern of results could be partially explained by relevant methodological and individual factors differences across studies. In the Karreman et al., (2007) study, the authors did not report the severity of the intellectual disability or the level of reading skills. Because individual factors are a major source of comprehension differences, we cannot rule out that these differences could be responsible for the positive effect of simplification in their study. Regarding the Fajardo et al. (2014) study, they asked participants to read printed texts, whereas our participants read online texts. Therefore, according to the shallowing hypothesis (Annisette & Lafreniere, 2017), both online texts and videos would be affected by a more superficial way of processing in comparison with print. In addition, the length of the documents varied across studies. Whereas Fajardo et al. used quite short texts (M = 94 words), our texts were much longer (between 364 and 565 words). In fact, as the authors highlighted, text length was the variable that best predicted inferential comprehension in their study, such that the longer the text, the lower the comprehension accuracy. They argued that this effect could be due to low self-efficacy and reading motivation on longer texts. Text length would work as a superficial difficulty cue for participants that may have led them to actively avoid reading and, at best, become passive readers (Guthrie & Davis, 2003; Morgan & Moni, 2008). This last interpretation is worth exploring in future research because learning materials in vocational programs and other educational contents have to be long enough to provide useful information (e.g., a legislation document).

Finally, a third explanation for the absence of blog format and linguistic simplification as main factors is that they are interacting with other individual variables such as reading comprehension skills. In fact, our more significant result was that the level of reading comprehension skills was the only main factor that predicted blog comprehension accuracy and, in addition, this factor interacted with linguistic simplification and blog format.

The interaction between reading comprehension skills and linguistic simplification was surprising as revealed that higher comprehenders were actually hindered by the simplified versions of blogs while lower comprehenders were not affected by it. This result evokes the classical interaction between text difficulty (operationalised as ‘text cohesion’ in this literature) and readers’ previous knowledge according to which low-knowledge readers benefit from reading easy texts, whereas high-knowledge readers’ comprehension often suffer when reading easy texts because only superficial reading strategies are activated when texts are too easy or cohesive (McNamara et al., 1996; McNamara & Kintsch, 1996). In our case, instead of readers’ previous knowledge, we measured reading comprehension skills as an individual factor but we could predict that reading skills and previous knowledge are affected in the same way by text difficulty so that when we linguistically simplified written or oral discourse, what we are doing is to reduce the challenges for more skilled readers who adopt a passive strategy that, in turn, affect their learning from the oral or written text.

However, subsequent findings from Ozuru et al. (2009) were against this prediction as they revealed that readers’ reading skill and previous knowledge do not interact in the same way with text difficulty. In fact, they found that skilled participants gained more from easy (high-cohesion) texts than from difficult texts while less skilled participants were not affected by it. They argued that increasing text cohesion often involves adding more information (e.g., connectives between sentences, word definitions or noun overlaps), resulting in increased text length and density. As a consequence, comprehension of a highly cohesive text (simplified or easier texts) may require higher level of reading skills because it involves processing larger amounts of information. In other words, only skilled readers would benefit from easy texts because they are usually longer. Conversely, our results showed that more skilled readers with intellectual disability were affected negatively by linguistic simplification so the linguistic simplification techniques implemented by us in this study were not only adding explicit information to the text but, somehow, changing the nature of the discourses (oral or written). In agreement with this idea, some authors argue that simplified texts use unnatural and atypical language structures while authentic (non-simplified) texts provide more natural language and naturally occurring cohesion than simplified (Crossley et al., 2007). For instance, Crossley et al. found that a set of authentic texts analysed in their study contained on average, higher number of ‘if’ and conditional clauses than a set of simplified texts. The reduction of conditional clauses could reduce the syntactic complexity of the text but, in addition, make more difficult to infer implicit hypothetical situations for both more and less skilled comprehenders. In our case, as it can be seen in Table 1, linguistically simplified blogs had similar number of words than non-simplified ones but the number of sentences per phrase was lower and the number of paragraphs was higher because, following one of the guidelines of the IFLA, each individual idea was placed in a separated sentence (which correspond with paragraphs) followed by a final point so the resulting texts, especially in the oral condition, were simpler syntactically but were presented in list shape which is not that natural. In conclusion, we could say that linguistic simplification might be creating unnatural linguistic material (oral or written) that can be even more difficult to comprehend for readers with more reading comprehension skills.

In next paragraphs, we address the applied implications of these discussed results for professionals working in education and other fields like employment support as well as the methodological limitations of the present study.

### 4.1 Practical implications

Our first practical implication is that traditional reading comprehension skills, such as the ability to identify key ideas in a text and make bridging and elaborative inferences, are essential for the digital literacy of people with intellectual disability, as is the case for students with typical development (Salmerón et al., 2018). Accordingly, educational programs for people with disability should emphasise direct training in traditional reading comprehension skills. We would recommend not only more direct training in traditional reading comprehension skills but also in digital skills such as pausing and browsing back videos, navigating hyperlinked documents (e.g., Web pages, Wikipedia), integrating information from diverse sources (e.g., a section in a textbook and an Internet video) and evaluating the quality...
of information (e.g., to trust or not a report in social media). As we said above, young adults with intellectual disability are frequent users of the digital medium (Alfredsson Ågren et al., 2020; Delgado et al., 2019) which might help them to acquire basic digital skills but Internet exposition does not guarantee that such skills are mastered. In that sense, we recommend to explicitly teach not only basic digital literacy skills but also more advance ones like those included in the instructional program of Delgado et al. (2019) aimed at improving the ability of young adults with intellectual disability to evaluate controversial information from the Internet. This program consists of asking students to participate in small group discussions supported with graphic organisers, modelling and contrasting cases. As the authors suggest, promoting this type of Internet skills might increase the opportunities of young people with intellectual disability to make self-determined decisions about their life.

In addition, in order to conduct linguistic simplification, we have to be aware of the reading level of our students because it can be even counterproductive for those with higher competences either because the simplified texts induce a passive reading strategy (McNamara et al., 1996; McNamara & Kintsch, 1996) or because simplified texts are more unnatural and cohesive than non-simplified texts (Crossley et al., 2007).

Furthermore, we would recommend to be aware about over-confidence in young people with borderline to mild intellectual disabilities because, as we have shown in this study, their prediction of learning does not correlate with their actual understanding of learning materials regardless the format (videos or texts).

Finally, other issues related to linguistic simplification that can be considered to improve comprehension of learning material by young adults with intellectual disability are the use of pictures and graphic organisers together with text (Browder et al., 2013) and the involvement of target groups in the process of production and validation of the easy-to-read texts as some international guidelines (UNE, 2018) and organisations worried about self-advocacy suggest (Inclusion Europe, Europe; Plena Inclusión, Spain).

4.2 Limitations

One of the major limitations of the present study is the small sample size that might be increasing the risk of type II error, that is, not rejecting the null hypotheses for the effects of linguistic simplification or learning material format when they were actually false. Small sample size is, however, an intrinsic problem of the research with special groups because the inherently small population. In exchange, our study offers a rigorously designed methodological framework which can be used for other researchers and contribute to multiple laboratories replication.

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DATA AVAILABILITY STATEMENT

The supplementary material and data that support the findings of this study are openly available in Open Science Framework (OSF) at https://osf.io/63khp/?view_only=2339b36d8a664501b37643147fb075fa.

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