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The impact of text availability on task-demands understanding and question-answering in multiple-document reading

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In this study, we examined how first-year undergraduates understood and represented a set of questions that they were asked to answer based on three texts about advertising. Our main goal was to capture this process of task-demands understanding (i.e., task-model construction) and its impact on performance in a multiple-document reading context, with or without access to the texts. Fifty students read three complementary texts on advertising and answered ten comprehension questions. Additionally, they were asked to solve a question-demands assessment by indicating which paraphrase, among three options, better reflected each question's meaning. Participants with text availability were more successful in question-demands understanding, question-answering performance, and included fewer mistakes in their answers. Moreover, text availability moderated the relationship between question-demands understanding and question-answering performance.

KEYWORDS

reading comprehension, question-answering, task model, multiple documents, text availability

1 Introduction

The acquisition of knowledge and the development of skills, both in formal and informal educational settings, is closely associated with reading activities. Most reading contexts are characterized by the need to satisfy specific task demands. Particularly, in the academic context, it is common to find teachers asking their students to answer questions from a text (or texts) with the intention of promoting comprehension and learning from the materials. These activities have been named *task-oriented reading scenarios* (Vidal-Abarca et al., 2010) and require additional strategic skills included in the concept of *functional reading* (Ayroles et al., 2021; Rouet et al., 2017).

Answering questions requires the selection and processing of those pieces of texts that are relevant to solving the requested task (McCrudden and Schraw, 2007). However, there is an intermediate step between receiving the instructions and processing the text (or texts), which involves constructing a mental representation that reflects the reader's understanding of the task to be completed (Rouet et al., 2017). This process is also referred to as building a task mental model (or task understanding or encoding). It is commonly assumed that students will be able to understand correctly what they are asked to do. Consequently, when students do not complete the tasks successfully, failures are attributed

to the reading processes rather than to the initial starting point of building the task model (Cerdán et al., 2013; Llorens and Cerdán, 2012). In this proposal, we precisely aim to further investigate the role of task models by focusing on tasks that require readers to use several documents as opposed to just one text. In addition, we examine whether task understanding affects comprehension outcomes when the texts are vs. are not available at the time of answering questions.

1.1 The role of task models in reading comprehension

When reading from multiple documents, readers might be faced with different demands, such as answering questions. Answering questions is indeed a common reading activity in academic contexts. Research has provided consistent evidence of how tasks and different types of reading directives influence readers' online reading activity and their task products (for a review, see Wiley et al., 2018). In this regard, Rouet and Britt (2011) proposed the Multiple-Document Task-Based Relevance Assessment and Content Extraction model, or MD-TRACE. This model suggests a series of iterative steps reflecting the processing demands involved in task-oriented multiple-document reading situations. Firstly, the reader must understand the task demands and build the task model, i.e., a mental representation of the actions to perform (*processes* demanded by the task) and the outcomes to reach (*nucleus* or key information needed). The task model will determine whether to retrieve information from memory or inspect textual sources. If a text is not available, readers will answer from memory. If an external source is at hand (text available), then the reader will explore the text, select the relevant segments and process them. The task model might be updated as readers search and find relevant pieces of information. At this point, the reader can construct a *product model*, i.e., a possible answer to the question given at the beginning. Finally, the product model is compared to the task model to determine its suitability. If it is not suitable, the whole cycle of processes would be reinstated. Therefore, according to this model, task understanding is a critical component that influences the subsequent processes activated when engaging with the materials. Consequently, final performance on the requested tasks is also affected by task understanding, in addition to other relevant factors (e.g., the comprehension of the texts *per se*).

More recently, Britt et al., 2017 proposed the Reading as Problem-Solving (RESOLV) model, which complements the MD-TRACE. RESOLV suggests that competent readers construct two types of representations: a context model and a task model. *Context models* include a representation of the reading situation that reflects the selection and prioritization of cues drawn from the context (i.e., request, requester, audience, support and obstacles, self). In addition, readers can transform them into a task model, or an initial set of goals and strategies, which will be updated during the reading task. The reading activity will continue until the reader considers that the constructed response fulfils the demands of the task (i.e., different types of questions) and the context (i.e., Schoor et al., 2023).

These models, MD-TRACE and RESOLV, capture the key processes that are the focus of this study (i.e., task-oriented reading from multiple documents). The next section will examine empirical evidence supporting these models, specifically regarding the role of task understanding in the subsequent reading processes and task product.

1.2 The role of task understanding in question-answering

Early research in reading comprehension has shown that understanding the instructions impacts reading strategies and outcomes. For instance, Cerdán et al. (2011) designed a study to explore the information selection strategies employed by secondary school students (i.e., ninth graders) in a task-oriented reading situation. Participants had to answer six questions per text, three of which were manipulated so that the nucleus of the question (i.e., the information targeted by the question) matched more or less closely the literal wording of distracting sections of the text. Skilled comprehenders were able to discard the misleading cues and select the relevant pieces of text to answer the questions, while the less-skilled comprehenders were seduced by these cues. These results could indicate that students with a high comprehension ability construct a task model based on semantic cues (i.e., deeper understanding), whereas students with a low comprehension level create a task model based on superficial cues (i.e., literal wording, shallow understanding), at least in relation to the processing of the nucleus of the question. These results are consistent with previous findings indicating that less-skilled readers tend to fail to compute the local meaning of a noun or noun phrase before integrating it into the more global representation of the text (Hannon and Daneman, 2004).

Llorens and Cerdán (2012) specifically designed a measurement to capture task-model identification. In their study, a sample of undergraduates had to answer seven comprehension questions per text, as well as a "question about the question" (QaQ), either before or after answering each comprehension question. The QaQ required the participants to inform what they understood about the demands of the comprehension question. Particularly, they had to select the correct option among four alternatives, and these alternatives resulted from the combination of a correct or incorrect nucleus and a correct or incorrect process (i.e., the necessary actions to solve the question). The results indicated that QaQ are beneficial for performance, but only when provided before answering the comprehension questions. Thus, Llorens and Cerdán (2012) provided evidence for the predictive value of a task to measure question demands presented before students answered questions, in a sample of university students. It justifies the design presented in this article.

Cerdán et al. (2013) required ninth graders to generate self-explanations for comprehension questions before providing an answer to these questions, in an attempt to deepen students' understanding of the question demands. Contrary to their expectations, these self-explanations had no effect on skilled comprehenders and even hindered performance in less-skilled comprehenders. Particularly, explaining the questions discouraged less-skilled comprehenders from actively engaging in the text. Furthermore, the self-explanation protocols revealed that an incomplete and wrong understanding of the questions was more common among less-skilled comprehenders. Overall, the appropriate understanding of the task demands was highly correlated with the number of visits to relevant pieces of text, and, in turn, this variable was highly associated with success in task performance.

Cerdán et al. (2019) investigated the effectiveness of question paraphrasing in supporting students' comprehension of a specific task. Secondary school students (i.e., eighth graders) were required to answer five open-ended questions per text. A paraphrased version of each question, simplifying both the nucleus and process, was provided before students could give their answer, but only for one of the two

texts. Results suggested that the presentation of paraphrases improved the performance of less-skilled but not skilled comprehenders.

Finally, drawing on prior studies by Llorens and Cerdán (2012) and Cerdán et al. (2013), Ayroles et al. (2021) explored the effect of nucleus-focused QaQ on enhancing students' task model. Primary school students (i.e., fifth graders) were asked to answer "What do you have to find in the text to answer this question?" (task-model group) or "Is the word xxx present in the question?" (control group) prior to responding to the questions. Students in the task-model group provided more correct answers to the comprehension questions than participants in the control condition. However, no significant differences were found between the groups regarding the number of visits and time spent on relevant and irrelevant pieces of the text, perhaps because of limited strategic skills at this early grade level.

According to the evidence found, the correct identification of the task demands has a significant impact on performance. Studies conducted with secondary school students and undergraduates in the context of functional reading activities (i.e., reading for a particular purpose) consistently demonstrate that we might capture the initial stage of task-model formation (i.e., identifying the demands of a task before answering questions) by focusing on the rewording of the demands of the task (core information to be extracted from the text and cognitive process required, such as locate vs. integrate). The impact of the identification of task demands might vary under available vs. unavailable text, as we justify next.

1.3 Reading under available and unavailable conditions

Empirical evidence indicates that, at least when reading a single document, text availability seems to enhance readers' question-answering performance, as it allows them to revisit those parts of a text including relevant information for answering the comprehension question (Ferrer et al., 2017; Ozuru et al., 2007; Schroeder, 2011). Instead, when texts are unavailable, readers must rely on their initial mental representation of the texts to fulfill the task requirements. Furthermore, more recently, Sedlmayr and Weissenbacher (2025) manipulated text availability in a single-text question-answering scenario to examine the psychometric quality of the test. They found that text availability yielded better validity scores, making it more suitable for assessing reading comprehension in university entrance exams.

However, the effects of text availability may depend on factors related to the task or the individual. For instance, Ferrer et al. (2017) discovered that text availability interacts with question type, such that having the text available benefits performance only on literal questions (i.e., those requiring the copying of verbatim) but not on inferential questions (i.e., those requiring to integrate and elaborate ideas). Research also suggests that prior knowledge play a crucial role when texts are unavailable. When readers cannot revisit the text, they must rely on their mental representation, which is built from connections between the text content and the reader's prior knowledge. Consequently, lower prior knowledge leads to an incomplete mental representation, and thus, to poorer question-answering performance when the text is absent to compensate (Ozuru et al., 2007). Conversely, students activate specific question-answering strategies that involve searching, selecting and discarding information in light of the task demands, when the texts are available to search (Rouet et al., 2017). As previously suggested, these

processes can be traced with online measures (Ayroles et al., 2021; Cerdán et al., 2013; Vidal-Abarca et al., 2011).

More recently, Cerdán et al. (2021) conducted a study exploring the effects of text availability in a multiple-document question-answering scenario. Consistent with earlier research, they observed that performance on intratext questions (i.e., tasks that can be solved using information from a single text) benefits from text availability. However, this superiority effect of text availability was observed neither for intertext questions (i.e., tasks that require integrating information from multiple texts) nor for a delayed-recall task. In sum, when students answer questions from a text, a common literacy reading activity, text availability may play an essential role. The specific hypotheses will be presented next.

1.4 The current study

While understanding task demands is crucial for answering comprehension questions in single-text reading scenarios, prior research has not explored these issues in the context of multiple-document reading. This study aims precisely to investigate how university students identify the task demands (through a question-demands task completed just before answering questions) and answer comprehension questions based on multiple texts, comparing the effects of having the texts available versus not.

Based on existing theories and empirical evidence, we raised the following predictions. First, we predicted a performance gap, with students lacking text access scoring lower than those with access on both the question-demands task and the comprehension questions, including more mistakes. This boost, we reasoned, would result from students' ability to derive more information from the texts through strategic question-driven analysis, rather than relying solely on memory retrieval, when texts are available to them (Britt et al., 2017; Ferrer et al., 2017; Vidal-Abarca et al., 2010). This includes both information selection strategies and the updating of the task model during reading.

Second, we predicted that the availability of texts would moderate the relationship between success in question-demands understanding and performance on comprehension questions. In other words, the influence of task-demands understanding on question-answering performance should be stronger when texts are available than in a situation in which students answer from memory. Coherently with the previous hypothesis, when students have the opportunity to revisit text content, they can iteratively search for relevant information and update the task model as they inspect the text (e.g., Rouet et al., 2017). Thus, the influence of task-model formation on performance should be greater under this latter condition.

2 Method

2.1 Participants

Fifty first-year undergraduate students participated in the present study. They had a mean age of 18 years old. They participated in the study as part of the complementary activities for the course Educational Psychology (for preservice teachers). They were randomly assigned to available and unavailable conditions (25 in each group, respectively). The topic (unrelated to their direct academic experiences) was specifically

selected so that individual differences in background knowledge would not exert a significant effect. Students belonged to the same academic level which guaranteed equivalent levels of reading skill. Additionally, randomization of groups should mitigate any potential differences.

2.2 Materials

2.2.1 Texts and questions

Both the texts and the questions were presented in Spanish, the participants' first language. We used three complementary texts on the topic of advertising, with an average number of 841.67 words and an average readability score of 67.23 (not high difficulty). The readability scores of the three texts have been computed using the Flesch-Szigriszt Index (Szigriszt, 1992), which is a version of the classic Flesch Index in Spanish. Information about the word count and readability scores for each text separately can be observed in Table 1.

This set of materials (texts and questions) had been successfully developed and used in previous studies (i.e., Cerdán and Marín, 2019). The texts highlighted complementary aspects and strategies used in advertising to induce shopping behavior. Based on an analysis of ideas, 10 open-ended comprehension questions were built, which made students make inferences within a text or between two texts. The questions included 8 intra-text and 2 inter-text questions. The 10 questions were scored using a rubric, with each question receiving up to 1 point. Thus, the maximum score was 10. The inclusion of mistaken ideas was also considered. Scoring was done by two researchers, with agreement higher than 90%.

2.2.2 Question-demands task

We elaborated a task to capture the understanding of the question demands, based on the evidence of similar tasks in previous studies (i.e., Llorens and Cerdán, 2012). The assessment of question demands required students to select one of the three options which better reflected what the question said, just before answering each of the 10 questions. The correct option was a paraphrase which simplified the actual question and emphasized both the core content to be selected and the cognitive process required to answer (i.e., locate vs. integrate); the second option was an incorrect paraphrase, containing overlapping matching words with the original wording of the question; finally, the third alternative was an incorrect paraphrase with no word overlap. The three alternatives were counterbalanced across questions. Consistent with previous evidence (Llorens and Cerdán, 2012), this task should be administered before answering the questions and should be an appropriate proxy of task-demands understanding, with an impact on question-answering performance. Moreover, with this design, we aimed at differentiating superficial vs. deep processing of task demands (i.e., Cerdán et al., 2011). In this case, the maximum score was also 10.

2.3 Procedure

Participants were given general instructions on the type of reading activity they would perform. They all received a booklet with the texts and a separate booklet with the questions (assessment of question demands in a multiple-choice format, and comprehension questions, in an open-ended format). They were told to read the texts carefully, as they would answer a set of questions afterward. This initial reading would guarantee that students, regardless of condition, could create a Situation Model of the texts (Kintsch, 1998). After an average of 20 min reading, the texts booklet was removed for half of the sample (text unavailable). The other half kept the booklet to answer the questions. Then, students were told to complete first the question-demands task, and afterwards answer the comprehension questions. All the procedure was done on paper and pencil and lasted an average of 1 h.

3 Results

To begin, bivariate correlations were computed among the three dependent variables (*success in question-demands understanding*, *performance on comprehension questions*, and *number of mistakes in comprehension questions*) in order to explore their initial relationships. Table 2 displays these correlations, for the complete sample and for each experimental group.

Next, we performed a Multivariate Analysis of Variance (MANOVA) with *text availability* (available vs. unavailable) as the independent variable and the three previously mentioned dependent measures. Significant effects were found for the three dependent variables. First, we found a significant effect for the variable *success in question-demands understanding*, $F(1, 47) = 5.19, p < 0.05, \eta^2 = 0.09$. Students in the available condition benefited from having access to the texts when identifying the task demands ($M = 9.32, SD = 0.85$), in contrast to the lower performance shown by students without text access ($M = 8.60, SD = 1.15$). Moreover, students were more successful, in terms of comprehension performance, also in the available condition ($M = 5.62, SD = 1.29$) than in the unavailable condition ($M = 4.36, SD = 1.01$), $F(1, 47) = 12.02, p < 0.01, \eta^2 = 0.20$. Furthermore, we had also predicted that the availability of multiple texts while answering the questions would increase students' precision in the answers. This was precisely what we found. The number of mistakes was greater in the unavailable condition ($M = 2.04, SD = 0.88$) than in the available group ($M = 1.04, SD = 0.79$), $F(1, 47) = 15.85, p < 0.01, \eta^2 = 0.25$.

Finally, we conducted a moderation test that included the reading condition (available vs. unavailable) as a moderator of the relationship between students' question-demands understanding and their performance on comprehension questions. The model accounted for 40% of the variance in the performance score. Moderation analysis revealed a significant direct effect of reading condition on

TABLE 1 Characteristics of the three texts.

Characteristics	Text 1	Text 2	Text 3
Text title	Buy Now! (¡Compra Ya!)	The Keys to Neuromarketing (<i>Las Claves del Neuromarketing</i>)	The Purchase of Branded Products (<i>La Compra de Productos de Marca</i>)
Word count	723	1,007	795
Readability score	66.74	69.17	65.77

TABLE 2 Correlations between the three dependent variables.

Analysis level	Question-demands scores AND comprehension performance	Question-demands scores AND number of mistakes	Comprehension performance AND number of mistakes
Complete sample (<i>N</i> = 50)	0.239 (<i>p</i> = 0.095)	−0.408 (<i>p</i> = 0.003)	−0.582 (<i>p</i> < 0.001)
Text Available (<i>N</i> = 25)	0.486 (<i>p</i> = 0.014)	−0.415 (<i>p</i> = 0.039)	−0.541 (<i>p</i> = 0.005)
Text Unavailable (<i>N</i> = 25)	−0.278 (<i>p</i> = 0.179)	−0.122 (<i>p</i> = 0.560)	−0.187 (<i>p</i> = 0.371)

comprehension performance: $\beta = -8.49$, $t = -2.98$, $p = 0.004$. Likewise, the interaction between participants' question-demands understanding and reading condition significantly predicted the students' comprehension performance: $\beta = 1.06$, $t = 3.40$, $p = 0.001$. In particular, when the texts were unavailable, there was a non-significant negative relationship between question-demands understanding and comprehension performance ($\beta = -0.22$, $t = -1.16$, $p = 0.2512$). In contrast, when the texts were available, there was a significant positive relationship between these variables ($\beta = 0.85$, $t = 3.37$, $p = 0.002$). [Figure 1](#) represents graphically the moderation relationship.

4 Discussion

Task-demands understanding is a critical, albeit not exclusive, component that influences the subsequent processes activated when engaging with reading material. Depending on how the reader understands the demands of a task (e.g., the wording of the question), they will decide whether to retrieve information from memory or reexamine the material, and which specific segment(s) to focus on. This important process has garnered attention from the research community; however, it has not been studied in relation to other crucial elements in today's learning and reading environments: multiple-reading scenarios and text (un)availability. This has been the focus of the present research.

Particularly, we have observed that having the texts available during the question-answering process leads to better performance in the multiple-choice question-demands task, requiring readers to identify the correct question demands. As mentioned, this measure was based on the evidence of similar tasks in previous studies (i.e., [Llorens and Cerdán, 2012](#)). The correct alternative was a paraphrase simplifying the question, while the incorrect alternatives consisted of either an inaccurate paraphrase with overlapping matching words or an inaccurate paraphrase without word overlap. Therefore, these results reinforce the idea that having access to documents provides students with context, helping them better interpret task demands and allowing them to create a task model based on semantic cues rather than literal wording ([Cerdán et al., 2011](#)).

The advantage of having the texts available has also been observed in the open-ended comprehension questions requiring the readers to make inferences, both in the final score and in the number of mistakes (precision). This improvement may be related both to students' opportunity to reinspect the texts and select the relevant pieces of information to meet the task demands, and to the updating of the task model during reading ([Britt et al., 2017](#); [Ferrer et al., 2017](#); [Vidal-Abarca et al., 2010](#)). On the other hand, when texts are unavailable, readers must rely solely on memory retrieval, limiting the possibility of activating strategic skills.

It is important to highlight that, although university students were quite accurate in the task-demands identification task, their scores on

the comprehension questions were notably lower. This suggests that successfully identifying questions is a necessary but not sufficient condition for successfully answering them. In previous studies conducted with single texts, there was not as much discrepancy between success in task-modeling and question-answering (e.g., [Llorens and Cerdán, 2012](#)). Therefore, the larger gap between task understanding performance and question-answering success may be due to the additional complexity of solving tasks using multiple documents. However, there are alternative and complementary explanations for the low scores on the comprehension questions. For instance, the comprehension questions were open-ended, whereas the question-demands task was in a multiple-choice format. Open-ended format requires not only text comprehension skills but also writing abilities, which may have increased the difficulty of the task. As such, it could partially account for participants' low performance. Moreover, individual variables, such as low motivation, reading skills or prior knowledge could also explain the results. Unfortunately, these variables have not been directly measured in the present study.

Furthermore, in the present study, we analyzed whether the relationship between question-demands understanding and comprehension performance differs depending on text availability. Our findings indicate that text accessibility moderates the relationship between these variables. Specifically, these are significantly positively correlated when texts are accessible, whereas no significant relationship is observed when texts are unavailable. These findings suggest that the role of task-model enhancement aids—such as questions about the question (QaQ)—in improving comprehension may only be effective when readers have access to the texts during the question-answering process. This appears to be the case, at least in a multiple-document reading scenario with undergraduate students. As commented, when students have the opportunity to revisit text content, they can look for relevant information and update the task model during reading (e.g., [Rouet et al., 2017](#)). Consequently, the influence of task understanding on comprehension performance should be greater when there is text availability. This insight extends previous research on task understanding and its effects on reading comprehension (e.g., [Ayroles et al., 2021](#); [Cerdán et al., 2011, 2013, 2019](#); [Llorens and Cerdán, 2012](#)).

Nevertheless, several aspects could be improved in future research. First, students performed highly successfully in the question-demands understanding task, reaching a ceiling effect. This may indicate that this measure is not sensitive enough to identify individual differences in task-demands understanding and that other formats should be explored (i.e., open-ended format). Additionally, incorporating a measure to assess learning beyond immediate performance would enrich the findings, as well as including online measures during reading. Along similar lines, including measures of individual differences (e.g., age, reading skills, prior knowledge, motivation, cognitive load, executive functioning) would not only offer a more detailed characterization of the participant sample and allow for

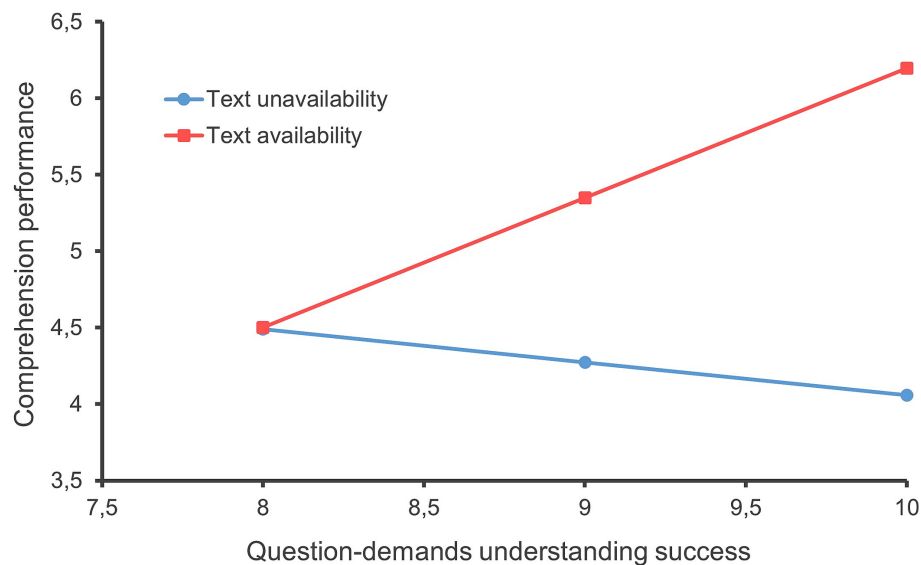


FIGURE 1

Moderation effect of text (un)availability on the relationship between question-demands understanding success and comprehension performance.

checking the equivalence of both experimental groups, but also enable the exploration of how these variables interact with those examined in the current study. These interactions could offer alternative explanations for the relationships observed in the analyses conducted. Executive functioning variables are especially important for research on task-oriented reading. For instance, working memory has been observed to play a role in several processes that support multiple-text comprehension, including epistemic cognition, web searching, and identifying text structure (Tarchi et al., 2021). These processes are well represented in both MD-TRACE (Rouet and Britt, 2011) and RESOLV models (Rouet et al., 2017).

Finally, given the relatively small sample size of this study, the results should be replicated using power analysis to estimate the appropriate sample size. Additionally, a potential restriction in the range of scores may have reduced the variability necessary to detect subtle effects or relationships, which should be addressed in future studies by ensuring a broader range of participant performance.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not required for the studies involving humans because it was conducted with adults and did not involve the processing of sensitive personal data as defined in Article 9.1 of the EU General Data Protection Regulation. Specifically, the data collected in this study do not concern an individual's racial or ethnic origin, political opinions, religious or philosophical beliefs, trade union membership status, health or sex life, or sexual orientation. The studies were conducted in accordance with the local legislation and

institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MG-S: Methodology, Formal analysis, Writing – original draft, Conceptualization, Validation, Investigation, Visualization, Writing – review & editing. RC: Data curation, Conceptualization, Resources, Project administration, Writing – review & editing, Funding acquisition, Methodology, Supervision, Formal analysis, Investigation. J-FR: Supervision, Conceptualization, Writing – review & editing, Resources, Validation, Methodology.

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Conflict of interest

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