

## **L2 Reading in Healthcare Contexts: Informed Research Methods with Language Diverse Patients**

Cindy Brantmeier<sup>1</sup>  
Washington University in St. Louis

Dorothy Pokua Agyepong  
University of Ghana

Amanda Dube  
University of California San Diego and Rady Children’s Hospital

Michael Strube  
Washington University in St. Louis

Jacaranda Van Rheenen  
Washington University in St. Louis

Jessie Wills  
Washington University in St. Louis

Uma Paithankar  
Washington University in St. Louis

Rachel G.A. Thompson  
University of Ghana

Lisbeth M. Brevik  
University of Oslo

Greta Björk Gudmundsdottir  
University of Oslo

Christi Smith  
Georgetown University

Thammatat Vorawandthanachai  
Maimonides Hospital, New York City

Fred Ssewamala  
Washington University in St. Louis

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<sup>1</sup> Corresponding author

Proscovia Nabunya  
Washington University in St. Louis

## Abstract

This study is a renewed effort for applying theory and research in Applied Linguistics (ApL) to today's healthcare needs. Previously, to analyze language use with linguistically diverse patients during the COVID-19 pandemic, researchers bridged self-assessment (SA) research in ApL to Public Health through the development of an instrument used with 338 healthcare workers (Brantmeier et al., 2021). SA was previously researched in second language (L2) studies with a contextualized, criterion-referenced instrument where learners self-diagnose strengths and weaknesses across language abilities. Studies validated the relationship between the SA instrument and language achievement (Brantmeier, 2005; 2006; Brantmeier & Vanderplank, 2008; Brantmeier et al., 2012; Liu & Brantmeier, 2019). The present study uses a subset of data (Brantmeier et al., 2021) to highlight findings related to reading and substantiates the need for research-based understandings of second and foreign language reading in healthcare contexts.

**Keywords:** Applied Linguistics and Public Health, L2 reading, second language reading research, language diverse patients, reading in healthcare contexts, self-assessment research, machine translation of health texts, pandemic literacy, health literacy

There is no denying that mass quantities of online resources about COVID are now available across the globe and that readers are now familiar with the topic. At the onset of the recent pandemic, however, reading about COVID was like reading in a foreign language—the communications included words and phrases such as “contact tracing,” “social distancing,” “self-quarantine,” “incubation period,” “N95 mask,” and more. Many of us were not sure what these words meant and certainly did not know how to use them in complete sentences. Important, urgent information around COVID-19 arrived at every moment from many different sources ranging across social media, local news, governments, community organizations, and more. Knowledge about the pandemic seemed to change daily and was very context-dependent. It may be safe to say that pandemic literacy was a challenge for everyone.

In the face of the pandemic, in-person interaction was limited, and healthcare workers and doctors relied on remote means for communication. The World Health Organization recommended that doctors and patients communicate via teleconferencing or other remote methods without in-person contact, and people across the globe consumed information about COVID-19 by listening to and reading online sources. Patients often relied on written materials to educate themselves and reinforce the information provided verbally during telehealth visits. Across the USA, English has always been the language of transaction. Healthcare workers (HCWs) are not required to be proficient in a language other than English, and therefore, reading materials, in the form of pamphlets and brochures, are always supplied in English and only sometimes in other languages, such as Spanish and Chinese.

During COVID-19, the traditional human translations of written materials simply could not keep up with the need. The situation demanded translation of rapidly evolving updates, which were often transmitted to patients via digital content, such as websites, news outlets, social media, technical documentation, and more. Consequently, there appeared to be a heavy reliance on machine translations for speedy access to reading materials about COVID-19 across languages (Tensmeyer et al., 2022).

A lot is already lost when going from spoken to written communication, such as the use of non-verbal cues, and this loss is even worse when machines are used instead of humans for written translations. Although machine translations do have a place, they are not currently reliable enough for use in healthcare for several reasons: the translations do not modify health materials into plain language, and lexical items or words do not always mean the same thing across languages and cultures. Numerous studies have shown that machine translations, which, despite their limitations, are unfortunately sometimes used in healthcare, do not consistently provide accurate translations of medical information or instructions (Gaspari et al., 2015), and translation quality may vary due to differences between particular languages (Fitria, 2021; Suryani & Fitria, 2022). Specialized language and connected discourse that includes dialectal variations and terminology are an important part of conversations, but are often lost in written translations (Brantmeier, 2021).

During the COVID-19 pandemic, as the demand for easily accessible health materials available online across languages became increasingly critical, so did the need for research on the reading of health materials in this context. The present article specifically addresses details about HCWs perceptions regarding communications with patients that involved reading, as well as assessments of written materials provided to language minorities. Specific suggestions are offered for emerging scholars who plan to harmonize the fields of Applied Linguistics (ApL) and Public Health through research on reading.

## **Literature Review**

### *L2 Reading Theory and Research*

Early on, second language (L2) reading models focused on the binary constructs of bottom-up, or text-driven factors, and top-down, or reader-driven mechanisms. Bernhardt's (1991) L2 reading model was the first to capture factors involved in both word-level and text-level processing while also detailing the interactive nature of L2 reading with both cognitive and social perspectives. Specifically, the model accounts for micro and macro level features with both reader-based and text-driven factors, while also leaving room for unexplained variance (Bernhardt, 2003). In Koda's (2005) conceptual foundation for L2 reading, she illustrates how L1 and L2 reading theories must differ, and she includes specific factors such as L2 word recognition, intra-word awareness, sentence processing, and text structure. Later, Bernhardt (2011) offers a compensatory theory of L2 reading that incorporates L2 language knowledge, first-language literacy, and transient variables such as background knowledge and motivation. The model is the first to consider how L2 readers process and use the different factors in a compensatory and sophisticated way as they become more advanced, independent readers. The above theories

concentrate on L2 reading in educational contexts with formal and informal learning situations and in incidental situations, and clearly, the demands of reading in healthcare situations differ from L2 reading in the classroom setting. However, we can take valuable information that what we have learned from prior L2 reading research that has tested the conceptual models and apply it to reading in the healthcare context.

### *L2/FL Reading in Healthcare Contexts in Applied Linguistics Journals*

The vast majority of L2 reading research with adults is conducted with participants from universities who are enrolled in language programs. Coursework for language majors across the USA has traditionally focused on literature, and reading research has continuously used authentic texts, or readings that are written by the native speaker for the native speaker. The studies usually employ either narratives or expository texts, as these are the types of texts read in the advanced-level courses. Although this research is extremely important for the study of language acquisition at the university level, we can no longer ignore the enormous increase in the need for evidence-based practices about reading across languages for purposes outside of the language classroom.

As a basis for developing data collection instruments to study the immediate challenges of health literacy across the USA and the world, we can apply what we have learned from our laboratory and classroom-based experiments regarding interacting factors in L2 and foreign language (FL) reading. A search for prior studies published in several top journals of ApL that examine the reading of materials from healthcare contexts comes up with zero results. This is not surprising, given that the scope of top journals in ApL, such as *The Modern Language Journal*, *System*, and *Foreign Language Annals*, is on L2 research and discussion about the learning and teaching of foreign and second languages. These journals have routinely only included L2 reading studies that focus on reading as part of the language acquisition process in educational contexts. Journals specifically devoted to reading, such as *The Journal of Research in Reading*, which publishes papers on the learning, teaching and use of literacy in adults and children, and *Reading and Writing*, which emphasizes processes, acquisition, and loss of reading and writing skills, also do not appear to publish studies conducted on reading in healthcare contexts.

Two journals that specifically focus on a variety of issues of foreign language reading and literacy, *Reading in a Foreign Language* and *The Reading Matrix*, seem to leave room for this type of timely research. Recent studies that appeared in *Reading in a Foreign Language* use medical texts (e.g., drug interactions and cardiovascular disease) to examine factors related to strategy use that may impact successful comprehension by medical school students learning English in China (Li et al. 2022). Asgari (2019) examines the interacting roles of interest and anxiety in L2 reading and use two groups of students, one reporting interest in learning about health and the other reporting no interest in this topic. In this study, health is an arbitrary topic used only as a measure of interest; healthcare literacy is not the true focus of the study. In a study published in *The Reading Matrix*, researchers in Iran used readings from medical textbooks with medical students enrolled in the English for a Special Purposes program to examine the effects of willingness to read and metacognitive strategy training on comprehension (Hassanpour et al.,

2017). In that study, the authors do not specify the content of the medical texts used to test comprehension.

Although these studies are tailored to healthcare topics, the participants are students enrolled in language programs. There remains a critical gap in research regarding the reading of healthcare materials across contexts with populations that experience serious health disparities, such as immigrants, refugees, indigenous peoples, and racial and ethnic minority groups. L2 and FL reading researchers must further study implications for comprehension of print materials by these groups in order to work toward health equity. Interestingly, the journal *Adult Literacy Education: The International Journal of Literacy, Language, and Numeracy* currently has a call for a special issue on health literacy and adult education, with the scope of the issue including how to integrate health literacy into the language learning classroom. This upcoming issue will serve as a timely and important foundation for future research on L2 and FL reading in healthcare contexts.

### *Studies on Health Literacy with Language Minorities in the USA*

For some time, functional health literacy (HL) in English has been an ongoing obstacle for patients across the USA who do not use the language of healthcare professionals (Showstack et al., 2019). However, it is difficult to make generalizations because the concept of health literacy has been operationalized in a variety of ways in the literature (Sorensen et al, 2012). The Institute of Medicine's HL definition appears to be the most widely used, and it states that "Health literacy is the degree to which individuals can obtain, process, and understand the basic health information and services they need to make appropriate health decisions. However, health literacy goes beyond the individual. It also depends upon the skills, preferences, and expectations of health information and care providers: our doctors; nurses; administrators; home health workers; the media; and many others" (U. S. Department of Health and Human Services (USDHHS), 2000). Showstack (2019) asserted that, in the USA, a person's health literacy level is a stronger predictor of health status than factors such as age, race, income and education level; and recently, Paakkari and Okan (2020) and Abel and McQueen (2020) stated that health literacy had been underestimated in the COVID-19 crisis. In most studies on HL, English is the language of research because English is the dominant language used for healthcare in the USA.

In 2011, it was estimated that over 90 million Americans had "low" HL (Pleasant et al., 2011), and in 2015, approximately 26 million Americans reported limited English proficiency (LEP) (U.S. Census Bureau, 2015). It is the legal responsibility of the healthcare system to provide care for them in a language they understand (Executive Order 13166). Researchers in Public Health have thus far approached research on language barriers by concentrating on the measurement of HL in studies where patients completed instruments that include correct or incorrect answers to specific written questions about health in order to help identify HL levels. Pleasant (2011) argued that additional data-driven evidence to support the screening of health literacy was necessary.

Kim and Xie (2017) report that many HL measurement tools continue to focus on a single skill or are domain-specific, and these screening tools have varied advantages in different contexts. The authors detail a systematic review of the literature on internet-based services and literacy and showcase five different studies that developed new HL measurement tools that were grounded in the Medical Outcomes Trust and Institute of Medicine's report. Overall, the authors conclude that new health literacy screening tools are needed to identify skills for adequate use of eHealth services that are specifically tailored to people with low HL. Despite the lack of a broad base of evidence, HL has been used as an indicator to develop informed and principled public health materials and to guide communication methodologies (Andrulis & Brach, 2007; Baker, 2006; Chen et al., 2018; Rojas-Guyler et al., 2013).

To date, it appears that most literature on health literacy in the USA has concentrated on the English literacy screening of the patient or client. These screenings generally include questions about health to assess overall health-related knowledge; most studies do not intend to test participants' reading comprehension of health materials. Research regarding tools that screen for HL is not sufficient to address the challenges encountered by language minorities across the USA. Ownby et al. (2019) take the research in a new direction and review the use of mobile apps, discussing how levels of HL can impact a patient's ability to manage their interactions with the healthcare system. Specifically, the authors show that providing information at a low level of reading ability, including graphics and audio narration as well as text, can positively impact the likelihood of health behavior change.

Appendix A illustrates a review of selected studies that examine different factors involved in health literacy for all patients, as well as some specific to language minorities in different regions of the USA, in order to set the foundation for previously overlooked areas in need of further research. The present article attempts to fill the dearth with the following: it (a) shifts the focus from the patient's HL screening to the healthcare provider's assessment of the patient's reading, understanding, and use of written information during COVID-19, and (b) offers corresponding implications for the development of research instruments that address immediate needs for readers outside of the language learning classroom.

## **The Present Study**

Brantmeier et al. (2021) attempted to harmonize work across disciplines by developing and implementing a self-assessment (SA) survey, informed by work in Public Health and ApL, in order to examine perceptions of healthcare workers about language use with language minority patients during the COVID-19 pandemic. The present study uses a subset of data collected from healthcare workers in the greater St. Louis area, located in the middle of the United States (Brantmeier et al., 2021). The subset of data for this current study, which focuses on reading and print material, was not part of the previous publication. Approximately 2.8 million people live in the St. Louis metro area, and in 2017–2018, the area had approximately 5,640 foreign-born individuals (including immigrants, refugees, and foreign students) (Grider, 2019). Refugees arriving in the St. Louis region represented 15 different languages in 2019 and 14 different languages in 2020 (reported by the International Institute of St. Louis). The following research

questions guide this study and specifically examine items related to L2 reading that have not yet been published:

1. How much of the communication between patients and HCWs involved L2 reading?
2. What were HCW's perceptions about their patients' ability to read L2 healthcare materials at the onset of COVID-19 and one year later? Did patients and clients ask questions about L2 written information?
3. Were the L2 written materials about COVID-19 modified for L2 readers? Did patients need help reading L2 materials?

## Methodology

### *Materials*

Self-assessment (SA) is a factor previously researched in second language acquisition studies with a contextualized, criterion-referenced instrument for language where learners self-diagnosed their own strengths and weaknesses across language abilities. The prior research offers evidence to validate the relationship between the SA instrument and achievement (Brantmeier, 2005; 2006; Brantmeier & Vanderplank, 2008; Brantmeier et al., 2012; Liu & Brantmeier, 2019). Brantmeier (2021) utilized SA as a way to analyze communication within dimensions of health literacy, including demographic characteristics of healthcare workers, information available from the community and healthcare facilities, oral communication with patients, and the training of healthcare professionals.

*An SA instrument.* After a review of the literature on health literacy across the disciplines of medicine and applied linguistics, a tailored, theory-based SA instrument was developed to examine the perceptions of HCWs about communication with language diverse patients at the onset of, and one year into, the COVID-19 pandemic. The preliminary online, written survey was piloted with 15 HCWs to assess the total amount of time spent to complete the survey and to provide feedback on any ambiguities or clarifications with survey items. Ultimately, the survey was condensed to 72 questions. The final written, online survey took approximately 10-12 minutes to complete. We used 5-point Likert response scales, ranging from strongly agree to strongly disagree, for all questions in order to encourage precision in rating and approach consistency with equal intervals. The survey was initially sent out without an offer of compensation, and three weeks after dissemination, a \$10 gift card incentive was added to increase participation.

The questions were categorized as follows: Demographics, Information Available for Language Minorities, Oral Communication with All Patients, Communication with Language Minority Groups, Reading and Writing with Language Minorities, and Training for Healthcare Professionals. Demographic questions included self-reported age, gender, race, ethnicity, medical profession, division affiliation, healthcare facility affiliation, use of languages other than English at and outside of work, experience working abroad, and information about the provider's

patient population. For the present study, items for analysis were part of the reading and writing as well as the training sections of the survey.

The survey was prefaced by a letter briefly explaining the study, the length and online nature of the survey, and the following definitions: (a) for the purposes of this study, the term ‘language minority’ refers to those who use a language other than English as the dominant language in their home, and (b) a health care worker is one who delivers care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers and laboratory technicians. Participants were also informed that participation was optional, and all responses would be anonymous and analyzed in an aggregated form for research purposes in order to inform the development of training modules and procedures that account for differences in communication with language minorities. The Washington University in St. Louis Institutional Review Board approved this study.

*Procedure.* We recruited participants via email outreach to division heads, department chairs, unit supervisors, and other healthcare leaders at seven different hospitals, clinics, and healthcare facilities in the St. Louis region. Each email briefly explained the study and requested approval to distribute an online survey to health care workers in their respective division, unit, or program. These healthcare leaders sent the survey out electronically to potential respondents during a period of 6 weeks (February 22<sup>nd</sup>, 2021, to April 5<sup>th</sup>, 2021), approximately one year after the onset of the COVID-19 pandemic.

For the present study, only the items in the instrument that related to reading were included. With IRB approval, the online, written survey was sent out electronically to potential respondents by division heads or administrative assistants in each division during a time period of 6 weeks, approximately one year after the onset of the COVID-19 pandemic. The letter explained that responses would be used for research purposes and to inform the development of training modules and procedures to improve healthcare services for language minorities in general and during future pandemics. It is important to point out that this was not a longitudinal study. Instead, participants reported their current experiences and then were asked to recall what it was like at the onset of the pandemic.

### *Participants*

A total of 576 healthcare workers (465 women, 81 men, 1 third gender, and 2 preferred not to say) from the St. Louis region initiated the online survey. Ages ranged from 18 to 75 years and older. Any survey that had more than 20% missing data for the survey or in which the respondent spent less than 3 seconds on average per survey item was removed from the final data set. Ultimately, 338 respondents were included in the analysis (278 women, 59 men, and 1 preferred not to say). Participants were asked to indicate their profession and check all that applied in the list. The largest responding groups consisted of the following: 158 registered nurses, 56 staff nurses, 43 resident or fellow physicians, 31 others, and 27 attending physicians. Respondents were also asked to indicate their discipline, department, or division. The largest groups responding came from Pediatrics (127 respondents), Other (114 respondents), Internal Medicine (67 respondents), Intensive Care (42 respondents), Emergency Medicine (23 respondents), and Medical Oncology (21 respondents).

### Data Analysis

The R Version 4.0.5 (R Core Team 2021) was utilized to analyze the data. It is important to note that the survey questions specifically asked respondents to consider their current communications with patients, and also to recall what was true about those communications at the onset of the pandemic. Therefore, these data were examined using a repeated measures analysis of variance (ANOVA). Because a large sample size will produce statistical significance for trivial differences, we also report Cohen's  $d$  effect sizes. These are standardized mean differences; Cohen (1988) suggests the following descriptive thresholds for magnitude of  $d$ : small ( $d = 0.2$ ), medium ( $d = 0.5$ ), and large ( $d = 0.8$ ).

### Results

*RQ 1: How much of the communication between the patient and HCW involved L2 reading?*

Table 1 shows the distribution of communication options. Of the three modes of communication that involve L1 and/or L2 reading, HCWs report using email the most (36), followed by texts or other written online sources (32), and lastly, message boards (13). The most common forms of communication primarily involved spoken language (in-person visits at a healthcare facility, followed by telephone calls), with written forms of communication being used overall less frequently. It is important to note that the reading options occur less frequently than the other modes of communication that primarily involve speaking, and that in-person visits at the facility occur the most, followed by telephone calls.

Table 1. *My Communication with Patients/Clients Involves: (Please Check All that Apply)*

Category	Frequency	Proportion
Email	36	0.107
In-person visits at a healthcare facility	317	0.938
In-person visits to the patients'/clients' homes	14	0.041
Message board	13	0.038
Real-time video conference (telehealth that includes video)	71	0.210
Telephone call (no video)	135	0.399
Texts or other written online sources	32	0.095

*RQ 2: What were HCW's perceptions about their patients' ability to read L2 healthcare materials at the onset of COVID-19 and one year later? Did patients and clients ask questions about L2 written information?*

As indicated on Table 2 and Figure 1 below, the majority of respondents did not agree or strongly agree that patients from language minority groups had the capacity to interpret and understand written healthcare information in English, and the same findings hold true for the ability of this group to read and understand written information specific to COVID-19 in English. On a scale of 1-5, as depicted in the Figure, the majority of HCWs recalled feeling neutral at the onset of the pandemic and one year later felt somewhat better. Similar findings are reported for patients who

know what individual words mean when reading. Finally, respondents did not indicate that patients commonly asked them questions about written information during their visits, at either the onset or one year later.

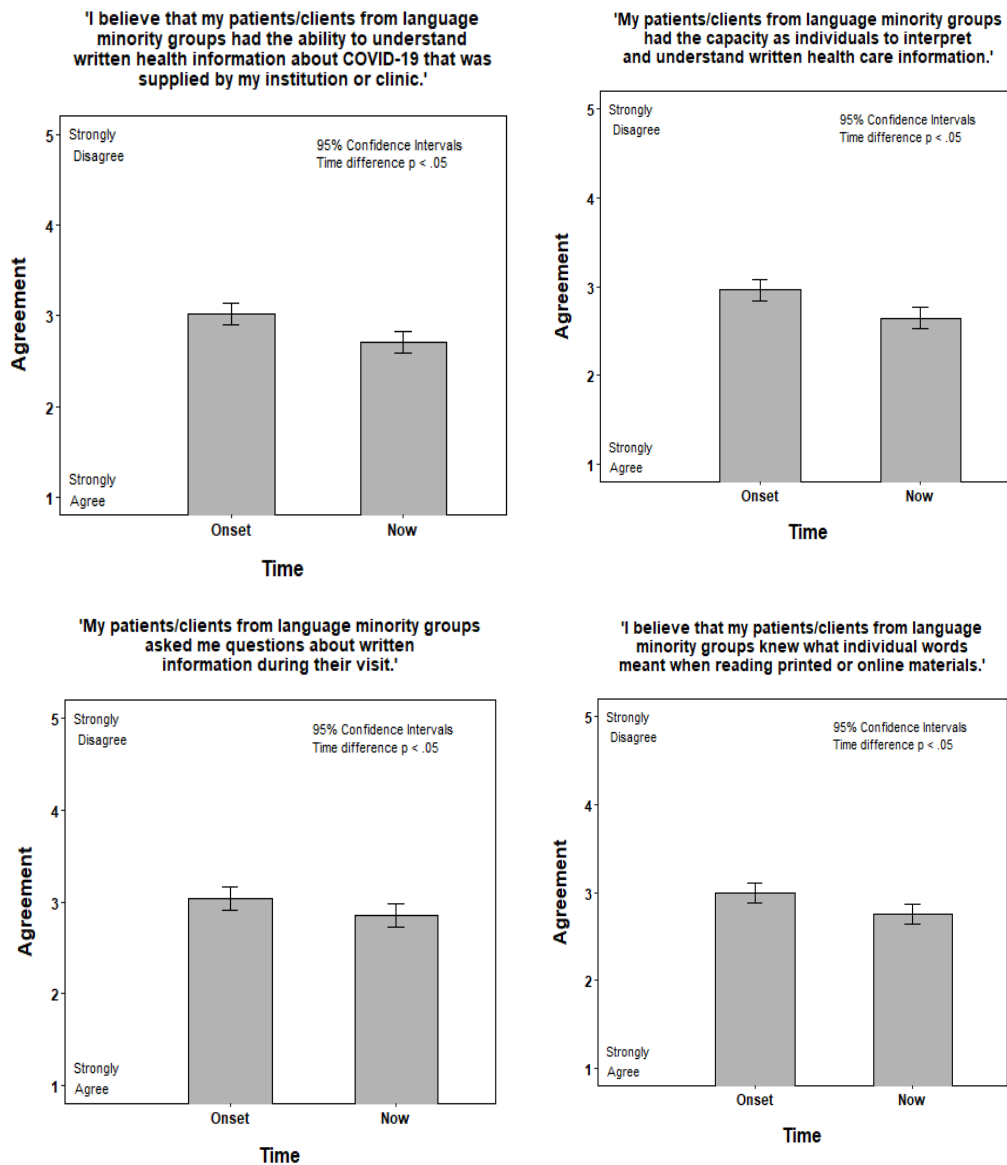
Table 2 lists the means, standard deviations, Cohen's *d* and *p*-value of the ANOVAs for the survey items related to research questions 2 and 3. After Table 2, findings for each research question are depicted via graphs with corresponding details.

Table 2. ANOVA with Mean (SD) at Onset, Mean (SD) Now, Cohen's *D*, *P*-Value.

Question Groupings	Survey Question	Mean (SD) Onset	Mean (SD) Now	Cohen's <i>D</i>	<i>P</i> -value
Reading and Writing	'My patients/clients from language minority groups had the capacity as individuals to interpret and understand written health care information.'	2.96 (0.06)	2.65 (0.06)	0.282	<0.001
	'My patients/clients from language minority groups asked me questions about written information during their visit.'	3.04 (0.07)	2.85 (0.07)	0.165	<0.001
	'I believe that my patients/clients from language minority groups had the ability to understand written health information about COVID-19 that was supplied by my institution or clinic.'	3.02 (0.06)	2.70 (0.06)	0.293	<0.001
	'I believe that my patients/clients from language minority groups knew what individual words meant when reading printed or online materials.'	2.99 (0.06)	2.75 (0.06)	0.237	<0.001
	'I believe that written materials that were disseminated about COVID-19 were modified so that patients/clients from language minority groups understood them.'	2.96 (0.05)	2.72 (0.05)	0.25	<0.001
	'I needed to help patients/clients read information about COVID-19 that was given to them during their visit.'	2.84 (0.06)	2.82 (0.06)	0.02	0.36

	'When I could not help my patients/clients understand the written information, I was able to get hold of someone to assist us.'	2.30 (0.05)	2.18 (0.05)	0.127	<0.001
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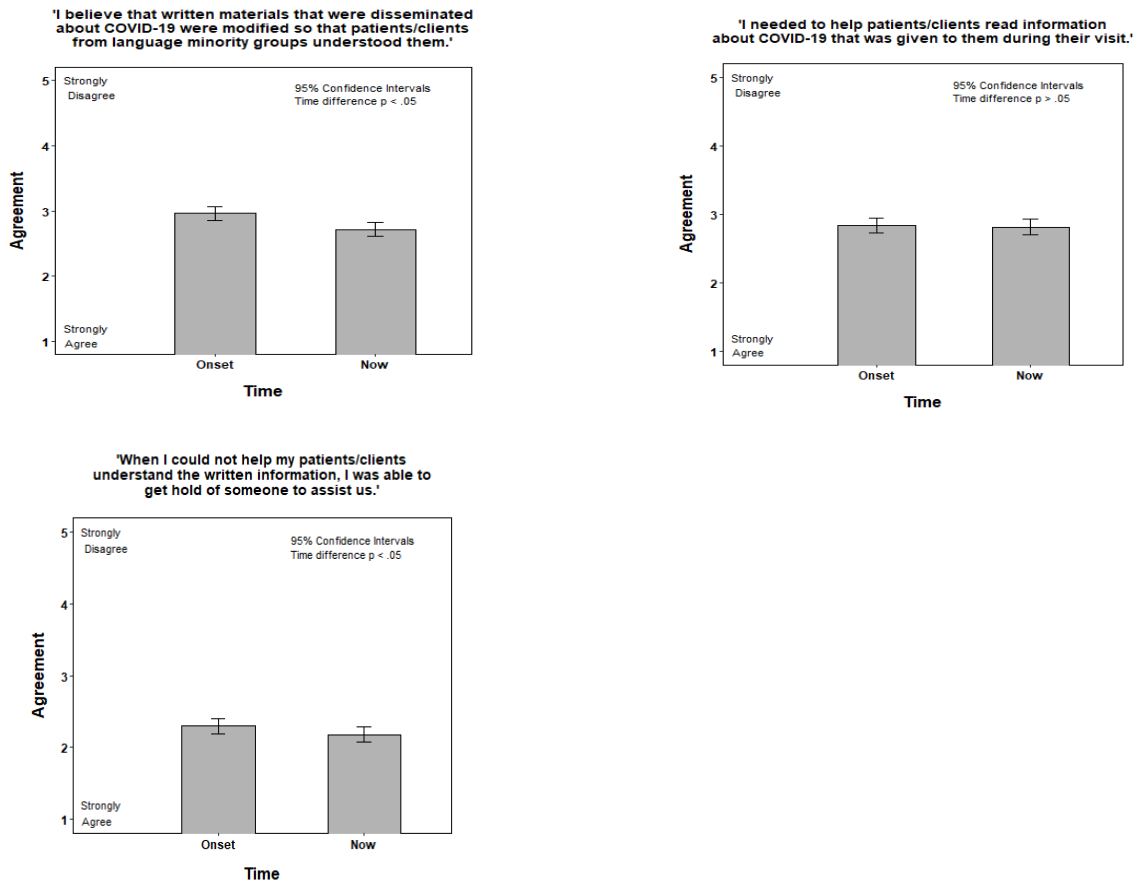
Note: 1 = Strongly Agree; 2 = Agree; 3 = Neither Agree / Disagree; 4 = Disagree; 5 = Strongly Disagree N = 338 participants



**Figure 1.** HCWPerceptions About Patients/Clients from Language Minority Groups Reading and Questions During Office Visits

*RQ 3: Were the L2 written materials about COVID-19 modified for L2 readers? Did patients need help reading L2 materials?*

As indicated in Figure 2 below, HCWs did not give high ratings for the dissemination of modified written materials about COVID-19. They also did not indicate that they needed to help patients read information given during the visit, at both time points. This is not surprising, especially during COVID-19, as office visits as well as virtual visits are structured with very limited time for HCWs to spend with patients. Interestingly, the highest level of agreement for the items in this section was for HCWs getting hold of someone to assist patients with reading. This indicates that the majority of hospitals or clinics in St. Louis may not have interpreters immediately available to assist language minority patients, or if they do, HCWs are not utilizing them. As noted on the individual graphs, findings revealed significant differences by time. Future studies should examine both the accessibility and use of interpreters.



**Figure 2.** Modified Written Materials About COVID-19 and Patients Needing Help with Reading During Visits

## Discussion

In the current study, HCWs reported that, generally speaking, communication with patients that involves reading occurs less frequently than the other modes of communication that primarily include speaking and listening. They also indicated that they communicate the most with patients during in-person visits and with telephone calls. Schonlau et al. (2011) contend that effective communication with patients should rely on oral conversation and written health information, not just a single literacy skill. With regard to communication that involves written materials, HCWs report using email the most, followed by texts or other written online sources. Ownby et al (2019) contends that the use of mobile apps in healthcare communications is becoming more frequent with the use of patient portals, and this points to why HCWs tend to use emails more than other online sources. Future research could examine how health information that is provided in an on-demand format, such as email, could take several forms that allow the provision of a video that includes text, audio, etc., especially for patients with low health literacy. Studies could gather insights about the content of written communication between HCWs and patients. It is customary that that emails or online exchanges occur after the in person office visit and is about the treatment plan. This type of on-demand reading and writing between HCW and patient should be studied so that HCWs could be trained to write simplified and modified discourse that includes inserted audio content, visual content, or both.

In the present study, HCWs specifically indicated low confidence in their patients' understanding of the L2 materials and reported feeling neutral about patients asking questions regarding L2 reading materials, at both the onset and one year into COVID. Researchers should continue the HL screening of patients with current screening tools, such as the instruments provided by the Agency for Healthcare Research and Quality (AHRQ), as these tools are free, and no permissions are required. Additionally, HCWs in the present study did not indicate strong confidence in the quality of language-modified written materials about COVID-19. This blends with Showstack's (2019) assertion that patients may not have language barriers, but instead, the healthcare system does. For quite some time now, researchers suggest that reading materials should be simplified and provided at a low level of reading ability for the patient (Soto Mas et al., 2013; Squiers et al., 2012). Given that most patients rely on mobile applications for follow-up communications with providers, future L2 reading research in healthcare contexts should consider knowledge from ApL in the design of studies in order to answer the overarching research question: *Do modified materials, such as insertions of audio narration and illustrative graphic elements, provide more accessible information to patients and clients who do not use the language of healthcare providers? If so, how?*

## Implications and Future Research

### *Research with Language-Modified Reading Materials*

Future studies that examine the quality of language-modified reading materials could incorporate a measure of both L1 reading ability as well as L2 and L knowledge (vocabulary and grammar), and, if possible, control for target language proficiency levels. One approach would be to use at least two different versions of 2–3 texts that are context-based and are currently used in healthcare settings, such as patient information pamphlets. Reading materials could also include different types of materials across studies, such as enrollment forms, intake forms, medical bills,

insurance claims, appeal letters, living wills, ingredients, and food labels, that involve the reading of health-related topics. One of the versions of each text should remain in the original form as it is currently used with patients. The modified version could be rewritten with an awareness of the language and culture of the target population for improved readability, and also account for the major characteristics of plain language. The modifications should take into account the four basic characteristics of print information that determine the complexity of written text: cohesion, decoding, vocabulary, and syntax (Spencer et al., 2019).

*Reading topic.* In addition to the specific types of language complexity that present obstacles to average readers, researchers should carefully examine the topic of the reading and be aware of the assumptions that the materials make about the patient's or consumer's HL. A measure for topic or background knowledge for each reading in the study should be developed. The effects of subject knowledge on L2 reading have been widely explored in research with participants studying English as a second language both within and outside the United States (Bügel & Buunk, 1996; Carrell, 1983; Hudson, 1982; Johnson, 1981; Mohammed & Swales, 1984; Pritchard, 1990; Steffensen et al., 1979) as well as in experiments with learners of foreign language programs in the United States (Brantmeier, 2002, 2003; Schueller, 1999; Young & Oxford, 1997). Findings across the literature demonstrate that unfamiliar topic knowledge is an instrumental influence on L2 reading comprehension. The power of prior subject knowledge should be accounted for in the modification of print materials in healthcare contexts.

*Analogies and adjuncts.* Analogies, where readers visualize scenes through personal associations, are often used with beginning L1 readers to account for a lack of background knowledge. The analogies may spark personal interest and curiosity and may positively impact comprehension. Analogies are sometimes used in health materials; however, research has shown with L2 readers that a large proportion of cognitive resources are used to decode words and identify syntactic structures of sentences, and the added structural features of an analogy hinder successful comprehension of scientific texts (Brantmeier, 2005). A better way to use textual inserts, instead of analogies, may be with inserted adjunct questions. Positive effects for inserted adjuncts have been found with L1 readers (Callender & McDaniel, 2007; McCrudden et al., 2010; Ozgungor & Guthrie, 2004) and growing research attention in L2 reading has demonstrated that inserted what and why questions failed to produce positive effects with different comprehension tasks (Brantmeier et al., 2011; Brantmeier et al., 2014; Medina et al., 2017). Recently, however, Li et al. (2022) reported that text adjuncts that include example generation did positively facilitate L2 reading comprehension measured by multiple choice tasks for those with lower L1 reading ability. Research that examines health materials could probe the effective types of inserted adjuncts with patients in health contexts and could tailor a reflective questionnaire, recently developed by Li et al. (2024) in a language learning study, to the experiences patients have while reading materials with inserted adjuncts. As mentioned earlier, the effects of inserting multimedia sources into online health materials, such as audio narration and graphics, should be studied.

### *Mixed Methods*

Additionally, along with the above suggestions, a mixed method approach could be used with both providers and patients when examining the reading process and reading comprehension in

healthcare contexts (Brevik, 2022; Creamer, 2018; Larsen-Freeman & Cameron, 2008). Conducting mixed methods research that involves an exchange of data from various sources is of particular relevance when unexpected or conflicting results occur (Brevik, 2022), such as those relating to HL, in an attempt to explain them. As such, the value-added of mixed methods lies primarily in “the tenacious pursuit of differences in interpretation that arise during the qualitative and quantitative analysis” (Creamer, 2018, p. 12). Furthermore, a mixed-methods approach in future research may establish trust and rapport between participants and researchers, which is crucial for gaining an accurate understanding of barriers facing emergent English speakers’ access to healthcare. Both health and language ability can be sensitive topics for many. Following the calls of Bourdieu and Wacquant (1992) and Bourdieu (2004) for epistemological vigilance, or the persistent attention and clarification of propositions and hypotheses that make intercultural work challenging, future research could include more opportunities for reflexivity in interviews and observations (Wolfe et al., 2021). A combination of approaches will allow us to gather rich contextual data and understand participants’ own interpretive work in their healthcare experiences without asking direction questions, as well as pursue causal understandings and descriptive data.

### *Research into Incorporation of Written Materials into Office Visits*

Finally, it is important to address that in the present study, respondents did not indicate that patients asked them questions about written information during their visits, at both the onset and one year into the pandemic. This could be because print materials are not disseminated until the patient leaves the office, but it also indicates that research about modified and simplified reading materials is not enough. Communication training for HCWs should also include modules that teach providers how to incorporate written and print materials into the office or virtual live visits in order to reinforce the important information and details addressed.

## **Conclusion**

Findings of the present study underscore the immediate need for further research on reading in healthcare contexts. The emergency of the COVID pandemic brought a sense of urgency to this need, and it is time for healthcare workers and applied linguists to collaborate and work together so we are better prepared for the next health emergency. Different dimensions of FL and L2 reading research can be directly applied to studies on the development of reading research instruments for use in health contexts with readers who have limited reading proficiency and who do not use the language of the health care worker (HCW). Corresponding benefits, especially for low-ability readers and those with less topic knowledge, could be directly applied to the development of reading materials that include linguistically and culturally tailored information. HCWs should be directly trained on how to simplify emails and other reading materials. It is our responsibility and legal mandate to provide high-quality healthcare to all individuals in the USA, regardless of literacy level or primary language. Effective communication, which includes accessible written information for everyone, is a powerful tool in the fight against health inequities.

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## Appendix A

### *Selected Studies that Examine Health Literacy and Language Minorities in the USA Prior to COVID-19*

Author/year	Research Questions	Participants	Data Collection Instruments	Findings
Andrulis and Brach (2007)	Clinicians and organizations  Location: Philadelphia, PA	Studies involving cultural and linguistic competence and health literacy strategies  Participants: Patients with limited English proficiency; members of racial and ethnic minorities (Alaskan Native/Native Americans, Black Americans, Hispanics)	Integrated approach to meet needs of limited-literacy, culturally diverse, and LEP patients	
Baker (2006)	How to define health literacy in components of individual capacity, health knowledge, and interaction with healthcare system  Location: Chicago, IL	Patients tested for HL  Participants: Patients	REALM, TOFHLA, HALS, and NVS	Computer-assisted testing with selecting items from a bank is a more accurate measurement with lower time requirements
Balyan et al (2019)	How to develop literacy profiles as automated indicators of patients' health literacy  Location: Kaiser Permanente Northern California's DISTANCE study	Primary care patients in California  Participants: Patients (large and ethnically diverse but not limited to language minorities)	Patient Secure Messages (SMs)	Natural language processing can help estimate Health Literacy
Barsell, Everhart, & Perrin (2020)	How valid is the AAHLS  Location: Elizabeth City, NC	University students in America  Participants: 366 Undergrad Mid-Atlantic University Students (English literacy a requirement; ethnically diverse)	AAHLS online survey	The 3-factor/subscale model with 8 items is improved

Berkman et al. (2011)	How has healthcare service and outcomes changed since 2004 in the context of HL  Location: North Carolina	Multiple  Participants: Patients and caregivers of all races and ethnicities.	81 Studies from 1966-2011	Future research priorities include novel approaches to increase motivation, techniques for delivering information orally and numerically, and determining the effect of policy and practice interventions.
Chen et al. (2018)	How to clarify mechanisms underlying low HL among people with LEP  Location: Southwestern U.S.	Chinese speakers with LEP in the U.S.  Participants: 405 native Chinese speakers with a limited English proficiency in the US (age range 18-96; time in US 1 month to 74 years)	Modified AAHLS survey	Modified AAHLS yielded reliable data.
Chen, Goodson, & Acosta (2015)	Review ESL health literacy curricula available in English-dominant countries  Location: Online databases: ERIC, Sage, Springer, PubMed, Medline, and Scopus	Multiple  Participants: Health consumers from seven distinct curricula across the US (California and Texas where a large number of non-English speakers reside) and Canada	18 Published Reports	Most curricula value either consent knowledge or language proficiently. Need for more longitudinal studies.
Freedman et al. (2012)	How can instructional foundations improve health education?  Location: Adult literacy center in the Atlanta area	Adult students in Atlanta  Participants: 21 adult education students and 3 instructors (students were African American or African and 76% were female)	Case study of 21 adult educational students	Introduce Better Education and iNnocation (BEAN) method for instructional foundation
NASEM Roundtable on HL (2017)	Questions surrounding health communication for immigrant and refugee populations  Location: Washington, DC	Healthcare educators and clinicians  Participants: Professors from across the US, Physicians, Professionals with related fields	Roundtable Discussion	Findings on health programs for teaching HL

Ownby, Acevedo, & Waldrop-Valverde (2019)	How can HL be incorporated into health promotion apps  Location: Florida	English and Spanish speaking adults  Participants: Patients who speak English/Spanish; race: White/Black/Other	Computer-delivered measure of HL	ASK model introduced. HL can be integrated into Theory of Planned Behavior
Rojas-Guyler et al. (2013)	Determine the HL levels of Latinos in Cincinnati  Location: Greater Cincinnati area	Spanish speaking adults in Cincinnati  Participants: 214 Latinos. Most participants chose to take survey in Spanish, 2/3 were married or living together, and under the age of 40.	Functional Health Literacy (FHL) and Health Literacy Level Assessment	Lower acculturation associated with lower HL
Rojas-Guyler et al. (2008)	Determine health seeking behaviors of Latino immigrants  Location:	Adult Latina women in Clinic  Participants:	Structured Interviews with 204 participants	Emphasis needed on giving attention to specific requirements of emerging populations
Sarver & Baker (2000)	Are patients who encounter language barriers during an emergency visit less likely to receive and complete follow-up appointments  Location: Harbor-UCLA Medical Center emergency department; in Torrance, CA	English and Spanish speaking adults  Participants: 714 English/Spanish speaking patients (over 18) with nonemergent problems.	Cohort study from a hospital	Patients with language barriers less likely to be given follow-up appointments but equally as likely to comply
Schonlau et al. (2011)	What is the relationship between literacy skills and HL?  Location: Boston, MA and Providence, RI	Adults in Boston, MA and Providence, RI  Participants: 618 Patients (ages 38-47); 78.1% non-Hispanic White, 16.8% non-Hispanic Black, 5.2% Hispanic or other race.	Tests of four literacy skills: reading comprehension, numeracy, oral language, and aural language. Woodcock Johnson II and 8-item test adapted from Lipkus et al.	Effective communication with patients must rely on oral exchange and written health information, not just a single literacy skill

Singleton & Krause (2009)	How can nurses provide better care to patients with cultural, linguistic, and HL barriers  Location: multiple	Multiple  Participants: Nurses  Case Study 1: Adriana originally from Puerto Rico  Case Study 2: Sola from Cambodia  Case Study 3: Debra African-American from Houston	Case studies, IOM reports, other studies	Nursing practices should incorporate cultural self-awareness to understand biases, as well as other cross-cultural competency strategies
Soto Mas et al. (2013)	Evaluate ESL instruction as a medium for HL among Hispanic Immigrants  Location: El Paso, Texas	Adult Hispanic immigrants  Participants: 12 ESL students	ESL classes	Developed and evaluated interdisciplinary HL/ESL curriculum with successful results
Squiers et al. (2012)	How can existing theoretical frameworks be improved to create new model for conceptualizing HL  Location: North Carolina, USA	Multiple  Participants: patients	Prior studies and conceptual frameworks	Developed Health Literacy Skills (HLS) framework to address HL and health-related outcomes

### About the Authors

Cindy Brantmeier is Professor of Applied Linguistics and Global Studies and Senior Research Advisor for International Research with Human Subjects at Washington University in St. Louis. Her laboratory-based research includes examining interacting variables in FL/L2 reading and FL/L2 testing and assessment. She also leads interdisciplinary research efforts to examine factors with health literacy and language use in the services provided to linguistically diverse patients. Email [cbrantme@wustl.edu](mailto:cbrantme@wustl.edu)

Dorothy Pokua Agyepong is Senior Lecturer in the Department of Linguistics at the University of Ghana. Her research focuses on semantics and pragmatics of African languages, sociolinguistics of youth, language use, and speech development. E-mail: [dpagyepo@ug.edu.gh](mailto:dpagyepo@ug.edu.gh)

Amanda Dube is Pediatric Hospitalist at the University of California San Diego/Rady's Children's Hospital. She is interested in pediatric hospital medicine, medical education and language equity in healthcare. E-mail: [adube@ucsd.edu](mailto:adube@ucsd.edu)

Michael Strube is Professor of Psychological & Brain Sciences and Education at Washington University in St. Louis and Professor of Physical Therapy at Washington University School of Medicine. He focuses on the impact of intrapersonal and interpersonal comparisons on affect, self-esteem, and life satisfaction. E-mail: [mjstrube@wustl.edu](mailto:mjstrube@wustl.edu)

Jacaranda Van Rheenen is Associate Director of the Midwest Developmental Center for AIDS Research. She works on a collaborative platform for researchers, public health workers, and policymakers to coordinate their efforts to fight HIV. E-mail: [jvanrheenen@wustl.edu](mailto:jvanrheenen@wustl.edu)

Jessie Wills is Program Assistant at Equal Access International, where she is working on the Securing Nigerian Communities project. Previously, she worked in an applied linguistics lab focusing on health system navigation for minority language speakers, and second language acquisition and testing. E-mail: [j.l.wills@wustl.edu](mailto:j.l.wills@wustl.edu)

Uma Paithankar is Research Technician at Mass General Cancer Center. Previously, she has been a Research Assistant investigating Second/Foreign language learning and health literacy. E-mail: [uma.paithankar@wustl.edu](mailto:uma.paithankar@wustl.edu)

Rachel Thompson is Research Fellow at the Language Centre at the University of Ghana. Her research focuses on ethnography of communication, and she has been involved in many research projects centered around culture and language use. E-mail: [rthompson@ug.edu.gh](mailto:rthompson@ug.edu.gh)

Lisbeth M. Brevik is Professor and Academic Chair in the Department of Teacher Education and School Research at the University of Oslo. Her field of research is language education and classroom observation, finding connections between English proficiency, online gaming, and reading comprehension. E-mail: [l.m.brevik@ils.uio.no](mailto:l.m.brevik@ils.uio.no)

Greta Björk Gudmundsdottir, is Professor in the Department of Teacher Education and School Research, and Vice Dean of Studies of Faculty of Educational Sciences. Her academic interests are professional digital competence, digital responsibility, and comparative and international education. E-mail: [g.b.gudmundsdottir@ils.uio.no](mailto:g.b.gudmundsdottir@ils.uio.no)

Christi Smith is Associate Teaching Professor at the University of Georgetown. She is interested in how politics and organizations shape processes of social inclusion and exclusion. E-mail: [cs2187@georgetown.edu](mailto:cs2187@georgetown.edu)

Thammatat Vorawandthanachai is OBGYN Resident at Maimonides Hospital in New York City. His research focuses on inequities in obstetric and gynecological care, anti-racism in healthcare practice and medical education, and reproductive justice. E-mail: [juweev@gmail.com](mailto:juweev@gmail.com)

Fred Ssewamala is Professor of Medicine at Washington University School of Medicine, the Director and Founder of the International Center for Child Health and Development, and the Director of SMART Africa Center at the Brown School at Washington University in St. Louis. His research informs, develops, and tests economic empowerment and social protection

interventions aimed at improving life chances and long-term developmental impacts for children impacted by poverty and health disparities. E-mail: [fms1@wustl.edu](mailto:fms1@wustl.edu)

Proscovia Nabunya is Assistant Professor at the Brown School at Washington University in St. Louis and a co-director of the International Center for Child Health and Development at the Brown School. Her research focuses on global mental health, HIV stigma, and family and community-based support systems as protective factors for the wellbeing of children in low resource settings. E-mail: [nabunyp@wustl.edu](mailto:nabunyp@wustl.edu)