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Correlates of Physicians' and Patients' Language Use During Surgical Consultations

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Abstract

A multi-method approach was used to explore correlates of technical and complex language use within 145 audio-recorded physician-patient interactions. When discussing the prospect of surgery, physicians used more technical and complex language (more jargon, larger words, longer sentences) than patients on average. Patients' demographic characteristics (education, health literacy, English fluency) and markers of health (condition severity) inconsistently predicted physicians' and patients' use of complex and technical language. Interactions with happier and more hopeful patients involved less technical and complex language, but physicians' language use was unrelated to patients' emotions following the consultation. Finally, physicians' use of more technical language predicted greater patient satisfaction following the consultation, and physicians' use of more complex language at the initial consultation predicted better adherence by patients following surgery. Our results highlight the nuanced role of language use within healthcare interactions and identifies language complexity as a novel target for health communication research.

Word count: 148

Keywords: *physician-patient communication, jargon, language, surgery, adherence*

Clinical encounters between patients and their physicians are often a dynamic process in which patients express uncertainty about their health and physicians in turn attempt to provide clarity about diagnoses, prognoses, and treatment options (LaNoue et al., 2018). Uncertainty about one's health is associated with both physiological and psychological consequences, including heightened pain sensitivity, reduced pain tolerance, psychological distress, and decreased quality of life (Wright, Afari, & Zautra, 2009). Thus, effectively communicating health information and keeping patients informed is central for developing strong physician-patient relationships and alleviating the stress of uncertainty surrounding one's health and healthcare (McWilliam, Brown, & Stewart, 2000). In the present study, we take a granular approach to examining a core component of effective interpersonal communication: the complexity of language use within real-world physician-patient interactions.

Medical Jargon and Technical Terminology

The quality of healthcare communication is limited or enhanced by patients' ability to access, comprehend, and apply medically-relevant information, collectively termed health literacy (Sorensen et al., 2012). For example, a study of patients diagnosed with ovarian cancer found that patients with lower health literacy reported receiving less information about their diagnostic test and were less satisfied with the information provided by their physician about treatment options (Verkissen et al., 2014). Not surprisingly, medical terminology is often poorly understood by patients—and worse, physicians often overestimate patients' ability to comprehend medical terms and their desire for technical information, resulting in unclarified jargon, confusion, and distress (e.g., Bagley, Hunter, & Bacarese-Hamilton, 2011). Exacerbating the problem, patients are often overconfident in their knowledge of common medical terms, thus complicating efforts to check with patients about their comprehension of information relevant to

their care (Chapman, Abraham, Jenkins, & Fallowfield, 2003). Conversely, use of layman's (i.e., everyday, familiar) language during physician-patient interactions has been linked to improved comprehension by patients and a greater sense of responsibility and control over their care (Ogden et al., 2003; Wiener, Gould, Woloshin, Schwartz, & Clark, 2013).

Studies of language use in clinical encounters often document high frequencies of jargon and other technical language within the medical context. For example, one study found that pediatric residents used an average of 72 jargon terms per conversation, providing further clarification to patients for only 17% of those terms (Farrell, Deuster, Donovan, & Christopher, 2008). In another study, medical residents used two jargon words per minute on average in an interaction with a standardized patient low in health literacy (Howard, Jacobson, & Kripalani, 2013). In stark contrast to their recorded behavior in these interactions, residents overwhelmingly claimed that they used plain language with their patients. Technical language may not only hinder comprehension but also evoke negative reactions from patients, including resentment, frustration, and prolonged distress (Wiener et al., 2013). Unsurprisingly, patients find it helpful when physicians use lay terms and clarify the personal relevance of technical diagnostic information for their daily functioning and disease trajectory (e.g., Wiener et al., 2013).

Investigations of vocabulary use within healthcare interactions suggest that physicians and patients influence one another's speaking style, such that physicians tend to use more medical terminology when interacting with patients who also use such terminology (Jucks, Paus, & Bromme, 2012). Perhaps for patients with strong health literacy, this concordance between their own and their physicians' language is beneficial for communication. In fact, despite the abundant evidence for the prevalence and consequences of unclarified medical jargon during healthcare interactions, some research points to benefits of technical language use. For example,

one study found that patients rated physicians who used more technical language as higher in professionalism and reported feeling more confident in those physicians' abilities (Ogden et al., 2003). Taken together, the existing literature identifies potential risks and benefits of technical language use in the context of patient-physician interactions, highlighting the need for further research to better understand how facets of language may hinder, or perhaps improve, the efficacy of healthcare communication.

Language Structure and Complexity

Compared to the relative abundance of studies examining physicians' use of technical language in interactions with patients, a paucity of studies has considered the implications of language complexity for patient outcomes. In fact, the authors are aware of no study that has examined even simple indicators of language complexity, namely the length of words and sentences, in patient-physician interactions. Instead, most studies exploring language use beyond jargon focus broadly on language barriers and cultural competence (e.g., Schouten & Meeuwesen, 2006). The only study to examine the structure of language in healthcare interactions investigated the role of pronoun use, verb tense, emotion words, and words indicating cognitive processing in the same dataset presented here (Falkenstein et al., 2016). However, that study targeted aspects of language more relevant to the content and process of communication rather than the complexity of language. The present study is thus the first we know of to examine links between objective markers of language complexity and patient outcomes in a healthcare context.

Overview and Hypotheses

In the present study, we used a multi-method approach integrating self-report measures with language analysis of audio-recorded surgical consultations to examine correlates and

consequences of physicians' use of technical and complex language. We examined associations between patient characteristics and outcomes and the use of jargon (versus everyday language), complex words (words over 6 letters), and complex sentences (more lengthy sentences) by physicians during surgical consultations. We also explored aspects of patients' use of technical and complex language within these clinical encounters.

Although some aspects of our investigation were exploratory, given the novelty of examining word and sentence length in healthcare contexts, the endeavor was guided by several hypotheses. First, we hypothesized that physicians would use more technical and complex language than patients on average (*Hypothesis 1*) and that physicians would use more technical and complex language with patients who similarly used such language (*Hypothesis 2*). Next, we hypothesized that patients' demographic characteristics would predict use of technical and complex language by both patients and physicians, such that interactions involving patients who were more educated, more fluent in English, and higher in health literacy would involve more of this language use by both parties (*Hypotheses 3a-3c*). Finally, we tentatively hypothesized that physicians' use of technical and complex language would be associated with poorer patient outcomes, including patient satisfaction, comprehension, emotional state, and adherence to recommended treatment and care (*Hypothesis 4*). The final hypothesis was tentative given the findings described above that point to some benefits of jargon use by healthcare providers.

Method

The data presented below reflect a subset of a larger study of patients (N = 382) recruited from the General Surgery Clinic of the Riverside University Health System (RUHS; formerly Riverside County Regional Medical Center; RCRMC) between November 2011 and January 2013. We examined select information collected from patients before and after meeting their

surgeon for the first time (in most cases) during a pre-operative consultation and once more after surgery, prior to a post-surgical follow-up consultation with their surgeon. This study and all procedures were approved by the Institutional Review Boards at the University of California, Riverside, and Riverside University Health System—Medical Center. Full study materials are available on the Open Science Framework (osf.io/2axb4), and deidentified data are available upon request.

Participants

A sample of six physicians (100% male; all physicians who saw patients during the relevant period consented to participate) and 145 of their patients (39.7% female, M_{age} = 46.1; 46.6% Hispanic/Latino ethnicity; 80.8% White/Caucasian race) scheduled for a pre-operative surgical consultation during the study period were included in our analyses. Patients' self-reported education revealed that 60.3% had completed high school, with 18.3% earning a degree from either a 2- or 4-year institution; 21.4% did not earn a high-school diploma. A majority of patients reported having health insurance coverage (82.5%). Patients were evaluated for an array of surgical procedures, including hernia repair (42.7%), followed by the removal of a soft tissue mass (15.6%), gallbladder removal (13.5%), rectal or anal surgery (6.3%), colon surgery (7.3%), a biopsy (7.3%), breast surgery (3.1%), and other procedures (4.2%).

Procedure

Patients were introduced to the study by a trained researcher, who conducted consent procedures and verbally guided the patient through an initial questionnaire on a tablet device in the exam room prior to the patient's consultation with a surgeon, providing clarification when necessary to ensure patients thoroughly understood each item. If both the patient and physician consented, the researcher then set up a recording device in the exam room, which was set to

record all ambient sound. Following the consultation, the researcher returned to the exam room to complete the second verbally-guided questionnaire, and the surgeon was prompted to complete a brief survey about the consultation.

Patients who underwent surgery and returned as scheduled for a follow-up appointment (for our analyses, $n = 56$) were again approached in their exam room by a trained researcher, who reminded the patient about the study and, if the patient consented to continue, conducted the final interview relevant to our investigation.

Measures

Patient pre-operative pre-consultation survey. Prior to the surgical consultation, patients completed a questionnaire that included measures of demographic information, English fluency (1 = *no fluency*, 10 = *perfect fluency; M* = 9.02 , *SD* = 2.26), state emotions (i.e., "How […] do you feel right now?"; 1 = *not at all*, 10 = *extremely;* nervous, *M* = 3.87, *SD* = 3.2; hopeful, *M* = 7.78, *SD* = 2.80; happy, *M* = 6.37, *SD* = 3.12), and health literacy using a well-validated single-item measure (Chew et al., 2008; i.e., "How confident are you filling out medical forms by yourself?"; 1 = *not at all*, 10 = *completely confident*; *M* = 7.12, *SD* = 3.34).

Patient pre-operative post-consultation survey. Immediately following the consultation, patients completed a second questionnaire that included follow-up measures of patients' state emotions (i.e., "How […] do you feel right now?"; 1 = *not at all*, 10 = *extremely;* nervous, *M* = 2.43, *SD* = 2.39; hopeful, *M* = 8.40, *SD* = 2.51; happy, *M* = 7.71, *SD* = 3.12), satisfaction with the doctor(s) they saw that day ("How much did you like the doctor(s) you saw today?"; 1 = *strongly dislike*, 10 = *like very much*; *M* = 9.25, *SD* = 1.51), comprehension of information ("Do you feel like you understood what the doctor(s) told you today?; 1 = *not at all*, 10 = *completely; M* = 9.55, *SD* = 1.31), and adherence intentions ("How likely are you to do

exactly what the doctor(s) you saw today suggested?"; 1 = *definitely not*, 10 = *definitely will; M* = 9.03, *SD* = 2.11).

Patient post-operative pre-consultation survey. Prior to meeting with their physician at the post-operative follow-up consultation, patients who had undergone surgery were asked to complete a final questionnaire. Pertinent to the current analyses, post-surgical adherence intentions were measured using the five-item General Adherence Scale (DiMatteo et al. 1993; for all items, 1 = *none of the time*, 5 = *all of the time*): "Generally speaking, how often since your surgery were you able to do what the doctor told you do?", *M* = 4.24, *SD* = 1.07; "Thinking about the time since your surgery, did you follow your doctor's recommendations exactly?" (*M* = 4.34 , *SD* = 1.12); "…did you find it easy to do the things your doctor suggested you do?" (*M* = 4.18, *SD* = 1.14); "…did you have a hard time doing what the doctor suggested you do? (*M* = 1.64, *SD* = 1.08); and "… were you unable to do what was necessary to follow your doctor's treatment plans?" (*M* = 1.96, *SD* = 1.58). Initial tests of internal reliability for the full scale after recoding the reverse-scored items produced a low alpha value (Cronbach's α = .36). Upon further examination, it was clear that the two reverse-scored items were unreliable (i.e., "I had a hard time…" and "I was unable to do what was necessary…"; see Tomás & Oliver, 1999 for discussion of similar reliability issues with reverse-scored scale items). Thus, a composite measure of adherence intentions was derived by removing the two reverse-scored items and averaging the three remaining items to maintain an acceptable degree of internal reliability (Cronbach's α = .75).

Physicians' pre-operative post-consultation survey. While patients complete the pre-operative post-consultation survey, physicians completed a questionnaire evaluating the patient's current health (1 = *extremely sick*, 7 = *extremely healthy*; *M* = 5.48, *SD* = 1.25), the severity of

the health condition that prompted the consultation (1 = *very mild*, 7 = *very severe; M* = 4.86, *SD* = 1.47), and the overall quality of the visit (1 = *very unproductive*, 7 = *very productive; M* = 6.06, *SD* = 1.12).

Analyses

Given the aims of the present study, analyses were restricted to patients who completed the pre-operative questionnaires, whose consultation was successfully audio recorded and transcribed, and whose consultation took place primarily in English. We restricted our investigation to English-language interactions because the nature of medical "jargon" likely differs considerably across languages. Additional analyses were conducted amongst a subset of this sample who had undergone surgery and returned for their post-operative consultation.

Transcript analyses. To provide a detailed examination at the nuances of language use, audio recordings were transcribed by a professional transcriptionist given the sensitive nature of the topic at hand and to minimize error. Once transcribed, files were separated by speaker (i.e., physician vs. patient) and independently analyzed to derive a comprehensive list of health-related terms used by these physicians and patients, ranging from lay terms (e.g. belly, hand) to highly technical terms (e.g. fistula, diverticulosis). A total of 1047 unique health-related root terms were initially identified and compiled, then broadened into a list of 1723 term iterations, reflecting simple variations (e.g., pancreas, pancreatic; biopsy, biopsied, biopsies) and more complex combinations (e.g., hernia, hiatal, hiatal hernia). Next, each iteration was rated by nine participants via Amazon's mTurk site on a 6-point scale (1/2/3 = *definitely/mostly/somewhat an everyday term, 4/5/6 = somewhat/mostly/definitely a technical term*; the instructions made clear that all terms should be interpreted in a health or medical context). A total of 154 raters were recruited (M_{age} = 33.14, 34% female), such that each rater evaluated approximately 100 terms,

and then these ratings were averaged to create a "word score" for each term, such that higher scores indicated more technical language (e.g., belly = 1.0, fistula = 5.2). Intraclass correlations (ICCs) between raters were well above acceptable levels both within each group, *ICC*s > .90, and in aggregate across all groups, *ICC* = .963 [95% CI: .92, .99]. Finally, the word scores for each occurrence of a health-related word were averaged for each individual speaker's transcript, creating a composite technical language score representing each physician's and patient's language use for each recorded interaction.

Next, each individual speaker's transcript was further screened for two dimensions of complexity: the frequency of large words and average sentence length. These statistics were derived from the Linguistic Inquiry and Word Count (LIWC; Pennebaker, Booth, Boyd, & Francis, 2015) software, which provides the total frequency of words over six letters and the average sentence length (number of words) within each speaker's transcript.

Statistical analyses. First, paired samples *t*-tests were used to assess whether physicians tended to use technical and complex language more frequently than patients during the pre-operative consultation. Second, bivariate correlations were used to identify whether physicians tended to reciprocate their patients' own language use. Third, multiple regression analyses were used to predict physicians' and patients' language use at the pre-operative consultation from various demographic characteristics. Language use was also predicted from features of patients' health status and emotional state prior to the consultation. Given the limited number of physicians included in our sample and homogeneity between them on key demographic characteristics (i.e., all male), only patient characteristics were used as predictors of language use. Finally, a series of simultaneous multiple regressions were used to predict patient outcomes from language used during the pre-operative consultation. Physicians' and patients' language

predicted patients' emotions following the consultation (additionally controlling for emotions prior to the consultation), comprehension, satisfaction with the doctor, adherence intentions following the pre-operative consultation, and reports of adherence from patients when they arrived for a post-surgical follow-up appointment. We also examined whether physicians' and patients' language use predicted physicians' reports of how productive they perceived the visit to be.

With the exception of *t*-tests comparing the frequency of physicians' and patients' language use, the grouping of patients within physicians were accounted for in all analyses using the CLUSTER option in MPLUS 7.31. The CLUSTER analytic step adjusts the standard errors to account for the non-independence of observations across patients who saw each physician. By using a "sandwich" procedure (the standard Huber-White procedure; Huber, 1967; White, 1980), the CLUSTER computation calculates robust standard errors that assume independence only between patients who saw different physicians, not across patients who saw the same physician.

Results

Language Use by Physicians and Patients

Consistent with *Hypothesis 1*, physicians (M = 2.42, SD = .45) used significantly more technical language than did patients (M = 2.27, SD = .64), $t(140) = 2.63$, $p = .0094$, such that health-related terms used by physicians, compared to those used by patients, were rated as more technical. Physicians also used significantly more complex language than patients, such that physicians used longer words (M = 11.09%, SD = 2.98) than did patients (M = 9.24%, SD = 3.56), $t(142) = 4.95$, $p < .0001$, and 58% longer sentences on average (M = 7.61 words, SD = 2.02) than did patients (M = 4.79 words, SD = 2.13), $t(142) = 11.32$, $p < .0001$.

Failing to support *Hypothesis 2*, physicians' use of technical and complex language was

not significantly associated with patients' use of such language (see Table 1).

Patient Characteristics and Language Use

For the remainder of our analyses, we focus solely on physicians' language use, given the lack of association between physicians' and patients' language and our particular interest in understanding the predictors and consequences of physicians' verbal behavior. Results for patients' language use can be found in the relevant tables.

Recall that we hypothesized both physicians and patients would use more technical and complex language when patients were more educated, more fluent in English, and higher in health literacy (*Hypotheses 3a-3c*). Multiple regression analyses predicted language use simultaneously from educational attainment, fluency, and health literacy. Results partially supported our hypotheses (see Table 2 for regression results). Regarding technical language use, physicians used marginally more technical language with patients who were more educated but also with patients who were less health literate. Regarding language complexity, physicians used longer words when interacting with patients who were more fluent in English.

Next, we explored whether aspects of patients' health were associated with physicians' language use using multiple regression analyses predicting language use simultaneously from physicians' ratings of patients' health and the severity of the patient's health condition (see Table 2). Neither patients' health status nor their condition's severity predicted physicians' use of technical language. Regarding language complexity, physicians used longer sentences (but not longer words) with patients whose conditions were more severe.

Additionally, we explored associations between patients' emotional state at the outset of the appointment and language use during the consultation using multiple regression analyses predicting language use simultaneously from patients' levels of nervousness, happiness, and

hopefulness (see Table 3). Regarding technical language, physicians used less technical language with patients who were happier and more hopeful at the start of the consultation. Regarding complex language, physicians used longer sentences and longer words with patients who were more nervous. We would note that neither patients' health nor the severity of their condition was significantly associated with their initial emotional state, all rs < .08, all ps > .14.

Associations between Language Use and Patient Outcomes

Finally, we examined associations between physicians' language use and a number of patient outcomes assessed following the initial consultation. Multiple regression analyses predicted outcomes from patient's and physician's language use, simultaneously, although we again focus on physicians' language uses here.

First, we examined links between language use and patients' emotional state following the visit, additionally controlling for their baseline emotional state (see Table 4). Patients' emotional state following the visit was unassociated with physicians' language use during the visit. Turning to patients' satisfaction with the doctor (see Table 5), patients were more satisfied when their physicians used more technical language. Regarding patients' comprehension of information conveyed during the visit, patients reported marginally greater comprehension when their physician used shorter words.

Regarding patients' adherence intentions immediately following the consultation, physicians' use of technical and complex language during the initial consultation was unassociated with adherence intentions immediately following the consultation. However, physicians' use of complex language during the pre-operative consultation significantly predicted greater patient-reported adherence at a post-surgical follow-up, which occurred weeks to months after the initial consultation. Specifically, patients reported greater adherence to their

doctor's recommendations when their physicians used longer sentences and longer words during the pre-operative consultation. It is important to note the shift in sample size for these analyses, as reports of post-surgical adherence were only collected from patients who underwent surgery and returned as scheduled for their follow-up visit.

Regarding physicians' ratings of overall visit quality, physicians found consultations to be less productive when they themselves used more technical language and when patients used longer sentences.

Discussion

By examining objective markers of technical and complex language alongside subjective measures of patient outcomes, our study extends prior research investigating language use during real-world healthcare interactions. In particular, our study is the first (to the researchers' knowledge) to investigate language complexity alongside technical language in relation to patient outcomes. Our findings highlight the importance of effective communication during healthcare interactions for patients' immediate and long-term well-being.

Dyadic Language Use

Replicating prior studies, our findings provide robust evidence that physicians use more technical and complex language than patients, highlighting the need for healthcare providers to be mindful of variability in patients' ability to comprehend health information when discussing treatment options (e.g., DiMatteo & Hayes, 1980). Given patients' often limited understanding of medical terminology, technical language in particular may interfere with their ability to feel engaged and involved with their care (Chapman et al., 2003). Additionally, less technical language during healthcare interactions may also improve patient involvement, facilitating language style matching, shared decision making, and rapport development within the dyad

(Charles, Gafni, & Whelan, 1999).

Additionally, the fact that physicians' and patients' language use were unrelated, paired with the weak and inconsistent associations between key patient characteristics and physicians' language use, aligns with the extensive literature suggesting that physicians often overestimate patients' ability to comprehend technical health information. As a result, physicians often fail to tailor their language use, restricting patients' role in treatment decision making and satisfaction with care (Howard et al., 2013). Future studies should examine the cognitive processes underlying physicians' language to test this possibility.

Physicians' Language Use

Our findings regarding predictors and apparent consequences of physicians' language use provided only partial support for our hypotheses. Aligning with our predictions, physicians in our sample seemed to vary the type of language they used based on their patients' health literacy and education, albeit only slightly. Interestingly, physicians tended to use *more* technical language with patients who were *less* health literate, indicating that perhaps the physicians in our study were not attuned to these patient characteristics. However, physicians also tended to use longer sentences and longer words with patients higher in English fluency, suggesting that physicians may inherently use more complex language with patients they perceive to be more fluent, regardless of the patients' objective contributions to the conversation.

Beyond demographic characteristics, our analyses also illuminated other predictors of language use in physician-patient interactions. Specifically, physicians used longer sentences when patients had more severe medical conditions and less technical language with patients who were happier and more hopeful prior to the consultation. These findings are partially consistent with prior findings suggesting that physicians tend to emphasize explanation when interacting

with patients with more unfavorable prognoses (Waitzkin, 1984).

Turning to patients' outcomes, the finding that patients were more satisfied with their physicians when they used more technical language seems counterintuitive, given the breadth of literature linking patients' receipt of clear information with satisfaction with their care (e.g., Mira, Tomas, Virtudes-Pérez, Nebot, & Rodríguez-Marín, 2009; Schoenfelder, Klewer, & Kugler, 2010). One potential explanation for this effect may be that patients in our study perceived their physician to be more professional and felt more confident in their physicians' abilities when the physician used more technical language (see Ogden et al., 2003), compensating for any lack of clarity the use of such language might create. Put differently, although patients may not fully understand what their physician is telling them about their health situation, perhaps they perceive their physician to be highly skilled and are satisfied knowing they are in good hands when the physician speaks in a complex way. Thus, physicians may be able to use complex language without sacrificing the quality of patients' care if they do so with an eye toward patients' comprehension of the information provided. Patient characteristics could also moderate the effectiveness of relatively more or less complex language. For example, patients who have a positive attitude toward a more paternalistic style of care (i.e., less focused on shared decision making) may be particularly satisfied with physicians who use complex language, whereas patients who wish to be fully involved in treatment decisions might prefer physicians who engage them with more familiar language. Although speculative given limitations of the present study, future studies should explore this possibility to determine the relative merits of clarity and apparent competence in physicians' choice of how to speak to their patients.

Perhaps most compelling are our findings linking physicians' use of complex language at

the pre-operative consultation with patients' self-reported adherence at the post-surgical follow-up consultation. Given the dearth of literature examining the nuances of language complexity in this context, we can only speculate that perhaps physicians' use of longer words and sentences represented an effective communication style when conveying the importance of adherence to their treatment and care recommendations. Physicians may use more complex language as they navigate treatment options and address patients' concerns, cultivating greater rapport within the dyad and ensuring that patients thoroughly understand their individual treatment plan. Alternatively, patients may have felt more respected by physicians who used more complex language, believing (perhaps subconsciously) that their physician saw them as intelligent and health literate and thus capable of "keeping up." In contrast, patients may have felt patronized by physicians who used small words and simple sentences, even if the ultimate outcome was greater understanding of their health condition and treatment options. Future studies that directly test these possibilities are a clear next step for research in this area.

We also note that the fact that physicians' complex language predicted adherence at the post-surgical follow-up but not adherence intentions immediately following the pre-surgical consultation highlights the fact that behavior often departs from one's best (or worst) intentions, although further research is needed to uncover the processes underlying this disparity. Taken together, these findings point to novel avenues for further research with potentially significant implications for both patient outcomes and healthcare costs, given the extent and implications of medical nonadherence (see DiMatteo, Haskard-Zolnierek, & Martin, 2011 for a review).

Next Steps and Questions to Consider

The current study sought to integrate both self-report assessments and ambient recordings to extend the results of prior research, bypassing traditional measures of communication quality

that rely exclusively on subjective impressions by trained coders (Paulhus & Vazire, 2009). Most notably, the novelty of including language complexity within our analyses revealed several nuances of healthcare communication, highlighting the utility of future studies that consider language complexity as an additional dimension of inquiry when examining physician-patient interactions. For example, the inclusion of language complexity may compliment discursive analytic approaches seeking to identify the underlying meaning and function of communication within healthcare interactions (e.g., Shaw & Bailey, 2009). In particular, it may be fruitful to explore the relationship between language complexity and outcomes derived from discursive analyses to investigate the deeper meaning, context, and nuances of physician-patient conversations.

The overarching goal of the current study was to generate new questions and identify avenues for replication, extrapolation, and future inquiry. Although our study provides insight into health-related communication, several limitations should be considered when drawing inferences from our results. First, our sample consisted exclusively of patients recruited from one medical center in Southern California. As a result, our sample is idiosyncratic relative to the general patient population, with the majority of patients in our sample self-identifying as Latinx and of relatively low socioeconomic status. Second, an exclusively male roster of six physicians was included in the study, thus biasing our findings toward their particular style of conversation or care. Third, our questionnaires did not include measures that would have allowed us to examine the roles of potential moderators and mediators of our effects, such as patients' preferences for different styles of care and preferences for involvement in decision making, which have been found to vary across patients (e.g., Chewning et al., 2012; Joseph-Williams, Elwyn, & Edwards, 2014). Therefore, future studies should examine the replicability of our

findings across a range of medical contexts and patient populations, such as among primary care physicians or patients with chronic illness, who may have different preferences for care and adopt more technical language use as they cultivate familiarity and rapport over the course of their treatment.

Despite these limitations, our findings broaden the field's understanding of the dynamics of healthcare communication, highlighting the use of complex language as a potential target for the innovation of clinical training interventions. Our study points to the complexity of subtle aspects of language use for creating barriers to, and perhaps at times facilitating, effective healthcare communication, emphasizing the importance of attending to physicians' implicit biases and individual differences across patient populations to improve patient outcomes and care.

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Table 1

Correlations between Physicians' and Patients' Language Use

	Technical Language (*n*s ≥ 135)		Six+ Letter Words (*n*s ≥ 135)		Words per Sentence (*n*s ≥ 135)	
	Physicians	Patients	Physicians	Patients	Physicians	Patients
Technical language						
Physicians	1.00	.14	.09	.05	-.01	.08
Patients		1.00	.07	-.06	.11	-.07
Six letter words						
Physicians			1.00	.09	.33**	.04
Patients				1.00	.07	.45**
Words per sentence						
Physicians					1.00	-.02
Patients						1.00

Note: $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .10$.

Table 2

Associations with Language Use

	Education (*n*s = 129)	Health Literacy (*n*s = 129)	English Fluency (*n*s ≥ 135)	Patient Health (*n*s ≥ 139)	Condition Severity (*n*s ≥ 136)	Optimism about Surgery (*n*s ≥ 120)
Technical language						
Physicians	.14†	-.15†	.07	-.12	.08	.07
Patients	.10	-.01	.18**	-.09	.004	-.02
Six+ letter words						
Physicians	.04	-.02	.26**	.02	.11	.01
Patients	.13	.05*	.18	-.005	.22**	.20*
Words per sentence						
Physicians	.01	-.004	.24**	.10	.21**	.08
Patients	.12	-.09†	.25**	-.23**	.15†	.004

Note: All statistics are standardized betas. $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .10$.

Table 3

Associations between Patients' Pre-Consultation Emotions and Language Use

	Happy (*n*s = 129)	Nervous (*n*s = 129)	Hopeful (*n*s = 129)
Technical language			
Physicians	-.23**	.05	-.20**
Patients	-.04	.07	-.01
Six+ letter words			
Physicians	-.01	.15**	.02
Patients	-.004	.08	-.07
Words per sentence			
Physicians	.02	.08†	-.003
Patients	-.18*	-.03	-.18*

Note: All statistics are standardized betas. $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .10$.

Table 4

Associations between Language Use and Patients' Post-Consultation Emotions, Controlling for Pre-Consultation Emotions

	Happy (*n*s = 129)	Nervous (*n*s = 129)	Hopeful (*n*s = 129)
Technical language			
Physicians	.01	-.02	-.01
Patients	-.08	.20†	-.02
Six+ letter words			
Physicians	-.001	.01	-.05
Patients	-.11	.05	-.07
Words per sentence			
Physicians	-.02	.06	-.03
Patients	-.08	.20*	-.08

Note: All statistics are standardized betas. $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .10$.

Table 5

Associations between Language Use and Patients' Post-Consultation Outcomes

	Satisfaction (*n*s ≥ 129)	Comprehension (*n*s ≥ 129)	Adherence Intentions (*n*s ≥ 129)	Surgeon's Perception of Visit Quality (*n*s ≥ 129)	Adherence (*n*s ≥ 50)
Technical language					
Physicians	.11**	.01	.10	-.16**	-.16
Patients	-.09	.04	-.07	.001	.06
Six+ letter words					
Physicians	.04	-.09†	.08	.06	.34**
Patients	-.14*	-.10**	-.10	.03	.05*
Words per sentence					
Physicians	.04	-.02	.03	.09	.34**
Patients	-.11	.01	.07	-.14*	-.08

Note All statistics are standardized betas. $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .10$.