# Language as an interpersonal marker in English dissertation acknowledgments

## MIAN JIA ⓘ AND YI AN

The University of Texas at Austin, Austin, United States, US, Texas, 78712-1139,
Beijing University of Posts and Telecommunications, Beijing, China, CN

Variations across genres and academic disciplines

## Introduction

Expressing gratitude and patronage in the form of dedication or acknowledgment can be traced back to the 16$^{th}$ century (Görlach, 2004). In the present time, writing an acknowledgment section has become a common practice in scholarly works, such as books, dissertations, theses, and journal articles. Research on acknowledgments as a text type, however, is relatively new. In his pioneering work, Hyland (2003) dubbed dissertation acknowledgments 'a Cinderella genre' because it is often regarded as a taken-for-granted component in a dissertation and has not received due academic attention. Unlike other conventional academic genres that aim to establish claims and reputation, dissertation acknowledgments reflect the reciprocal gift-giving among scholars, constituting 'the most explicitly interpersonal genre of the academy' (Hyland, 2004: 323). In addition to expressing gratitude to others, writers also use the acknowledgments section to build interpersonal relationships with their academic colleagues and/or professional communities (Chan, 2015). In this study, we adopt computerized text analysis to further explore how language patterns mark the interpersonal features in English dissertation acknowledgments.

Acknowledgments not only constitute a distinctive academic genre, but they also show variations across academic disciplines. Studies have suggested that each discipline has a different epistemological nature and disciplinary culture (Becher, 1994; Hyland, 2006). These disciplinary differences may also be reflected in the way writers construct their dissertation acknowledgments (Parry,

MIAN JIA is a PhD student in the Department of Communication Studies at The University of Texas at Austin. He is interested in exploring how subtle linguistic features (markers of agency, politeness, and metadiscourse) shape people's communication of their instrumental, relational, and/or identity goals. He has explored these processes in interpersonal, intercultural, and health communication contexts. His recent work appears in Lingua and Text & Talk. His co-authored textbook on pragmatics was recently published at Peking University Press.
Email: mianjia@utexas.edu

YI AN is a lecturer in applied linguistics at the School of Humanities, Beijing University of Posts and Telecommunications. He received his BA in English Translation from Southwest University, and his PhD in Linguistics from Beihang University. His research interests include pragmatics, corpus linguistics, systemic functional grammar, and discourse analysis. Currently, he focuses on public messaging in risk and health communication contexts. His recent publications include articles in Journal of Linguistics, Pragmatics, and International Journal of Communication, among others.
Email: yian@bupt.edu.cn

1998). For example, research in hard sciences (e.g., physics) is generally considered to be more collaborative than research in soft sciences (e.g., history) (Yang, 2012). As a result, writers in hard sciences are likely to use more third-person pronouns when crediting others' contributions (e.g., *his pilot study*, *her research data*, *his lab*). Existing research has shown that writers from soft sciences tend to use more stance markers (e.g., modal verbs, hedges), write in longer sentences, and acknowledge more emotional and social support from family members and friends than writers from hard sciences in acknowledgment writings (Chan, 2015; Giannoni, 2002; Hyland, 2003; Hyland & Tse, 2004). These studies have mainly approached the writing style of dissertation acknowledgments by explicating a three-tier rhetorical move structure of reflecting (recounting personal research experience), thanking (crediting individuals who helped), and announcing (acknowledging responsibilities and inspirations) (Billany, 2014; Hyland, 2003, 2004; Yang, 2012). Some others investigated the expression of stance in dissertation acknowledgments by examining their lexico-grammatical devices such as modal and semi-modal verbs, adverbs, and complement clauses. For example, Chan (2015) found that while writers in soft and hard sciences used stance markers to express volition, obligation, and attitudes, adverbs and complement constructions were more typical in soft sciences and modals were more common in hard sciences.

Computerized text analysis programs, such as Linguistic Inquiry and Word Count (LIWC; Pennebaker et al., 2015), offer an alternative approach to examining the writing style of academic texts (e.g., Tieken–Boon van Ostade, 2013, 2020; Wheeler et al., 2021). The working mechanism of LIWC is that it calculates the percentage of words in a text that corresponds to meaningful linguistic, social, and psychological categories in the LIWC dictionary. The internal LIWC dictionary was first evaluated by human raters and then empirically validated in different text genres such as blogs, expressive writing, novels, and social media texts (Pennebaker et al., 2015). Research on natural language and social psychology has consistently demonstrated connections between people's word choice and their social and psychological processes, such as their feelings and their thinking styles (Miller, 1991; Pennebaker, 2011, 2017; Tauszik & Pennebaker, 2010). For example, Tauszik and Pennebaker (2010) suggest that first-person singular pronoun (e.g., *I*, *me*) is a good indicator of informal and personal language style, and people who are

undergoing emotional upheavals tend to use more emotion words when describing their experiences. In a recent publication, Markowitz (2022) adopted LIWC to compare the writing styles of abstracts in articles written before and during the COVID-19 pandemic. He found that papers written during the pandemic displayed a lower level of analytical thinking and used more cognitive processing terms (e.g., *inform*, *question*). Using the same computer program, Wheeler et al. (2021) showed that academic writings in psychology have shifted to a more personal and more confident writing style between 1970 and 2016. This finding led them to critically assess whether there is a growing tendency to exaggerate research significance in recent publications. These studies demonstrate the utility of analyzing academic texts with LIWC. Few studies, however, have employed this method to investigate the taken-for-granted genre of dissertation acknowledgments, which is the aim of the present study.

In this study, the interpersonal features of dissertation writing were assessed in terms of four main LIWC categories: 1) analytical thinking, 2) tone, 3) dictionary words, and 4) social words. The reliability of these categories has been extensively tested in empirical studies (see reviews in Pennebaker et al., 2015 and Tauszik & Pennebaker, 2010). First, analytical thinking is a summary category of function words that measures the complexity of the writer's thinking style. Frequent use of articles suggests that the writer refers to more nouns in the essay, and more use of prepositions suggests that they are discussing the relationship among these nouns, both of which represent a more formal and logical thinking style (Pennebaker et al., 2014). More frequent uses of pronouns, impersonal pronouns, auxiliary verbs, conjunctions, adverbs, and negations are commonly found in more personal and narrative writings. The score in this category ranges from 0 to 100 and a lower score indicates a more narrative thinking style (Pennebaker et al., 2015). Second, tone is a summary category of positive emotion words (e.g., *happy*, *love*, *nice*) and negative emotion words (e.g., *worried*, *hate*, *crying*) (Cohn, Mehl & Pennebaker, 2004). Studies have shown that writers who feel more positive tend to use more positive emotion words, whereas writers who feel more negative tend to use more negative emotion words (Pennebaker, 2011). This category also ranges from 0 to 100, with higher values indicating more positive and upbeat writing styles; a score that is close to 50 indicates a neutral emotional tone (Pennebaker et al., 2015). Third, dictionary

words refer to the percentage of words that are identified by the LIWC dictionary (Tauszik & Pennebaker, 2010). The 2015 version dictionary is composed of roughly 6,400 tokens of words, word stems, and emoticons (Pennebaker et al., 2015). Since the internal LIWC dictionary was developed for general use, it did not include discipline-specific jargons (see Pennebaker et al., 2015 for the development of LIWC dictionaries). Therefore, a higher value suggests that the text contains a higher percentage of common words and a lower percentage of technical jargons, such as those often found in conventional academic texts, such as journal articles and monographs. Finally, the social words dictionary includes 756 words describing social processes (e.g., *mate*, *talk*, *they*), reflecting one's social support and social concerns (Pennebaker et al., 2015). In addition, LIWC also identifies four meaningful sub-categories within social words: family members (e.g., *daughter*, *dad*), friends (e.g., *buddy*, *neighbor*), female references (e.g., *girl*, *her*), and male references (e.g., *boy*, *his*). These sub-categories may provide meaningful indications of specific social categories dissertation writers discuss in their writings.

In the present study, we conducted two sets of comparisons to better understand how language patterns mark the interpersonal features in dissertation acknowledgments. First, since acknowledgments constitute a distinctively interpersonal genre (Hyland, 2004), their language patterns should be different from a less interpersonal genre, such as the dissertation abstract from the same writer (Swales & Feak, 2009). Second, since disciplinary culture influences people's writing styles (Hyland, 2006), writers from different disciplines should also display varying language patterns. Evidence that is consistent with our predictions would indicate that the four LIWC categories used in our study can provide valid assessments of the interpersonal features in dissertation acknowledgments.

## Method

### Data collection

Dissertation abstracts and acknowledgments were collected from Digital Access to Scholarship at Harvard (DASH, https://dash.harvard.edu). The DASH corpus was selected because it offers open access to sizable doctoral dissertations. Only including dissertations from a single university is to control the potential influence of other moderating factors, such as the university culture. We selected physics, engineering, and biology as representative hard science disciplines, and history, government, and economics as typical soft science disciplines. These disciplines were selected because they can represent some common features in hard and soft sciences (Becher, 1994; Hyland, 2006). Sixty dissertations were selected from each discipline. These dissertations were completed between 2012 and 2019. About half of the dissertations were recorded in 2018–2019 and the other half was recorded in 2012–2017. These texts were copied and pasted in separate Microsoft Word files and manually checked for copying errors, such as hyphenation between lines. Each text was labeled using discipline + genre + text number + publication year. For example, PDA0517 indicates that the text is the acknowledgments section from the 5th dissertation in Physics. The details of the abstract and the acknowledgments corpora are presented in Table 1.

| Table 1: Abstract and acknowledgment corpora (60 dissertations/discipline) | | | | | |
|---|---|---|---|---|---|
| | Abstracts | | | Acknowledgments | | |
| Discipline | word count | mean | SD | word count | mean | SD |
| Biology (B) | 24,519 | 409 | 130 | 41,237 | 687 | 508 |
| Engineering (En) | 19,523 | 325 | 118 | 35,148 | 586 | 430 |
| Physics (P) | 16,020 | 267 | 110 | 42,927 | 715 | 581 |
| Economics (Ec) | 19,817 | 330 | 126 | 15,777 | 263 | 192 |
| History (H) | 20,495 | 342 | 87 | 58,967 | 983 | 528 |
| Government (G) | 22,439 | 374 | 127 | 36,519 | 609 | 420 |
| Totals | 122,813 | 341 | 124 | 230,575 | 640 | 505 |

### Data analysis

All texts were analyzed using LIWC Version 2015 because it has shown validity in processing various academic text genres, such as journal abstracts and grant proposals (Hartley, Pennebaker & Fox, 2003; Markowitz, 2019; Wheeler et al., 2021). As indicated in the introduction, we analyzed four main LIWC categories, including analytical thinking, tone, dictionary words, and social words. To further explore the writer's social processes, we also analyzed the four sub-categories of social words, including family, friends, male references, and female references. The 2015 version of the internal LIWC dictionary was used to count the word frequency of each category. For example, the sentence 'I would like to thank my parents, my brother, and my friends for their constant support during my Ph.D. study' contains 20 words, and 100% of them are included in the LIWC dictionary. The sentence has a relatively low analytical thinking score (38.60), suggesting a personal and narrative writing style. The sentence also reveals a very positive emotional tone (99.00). The analysis also showed that 20% of the words (i.e., four words) in the above sentence are social words. Specifically, 10% of them referenced to family (i.e., *parents*, *brother*), 5% referenced to friend (i.e., *friend*), 5% referenced to male (i.e., *brother*), and none of them referenced to female. After analyzing the corpus with LIWC, SPSS Version 25 was used to conduct the subsequent statistical comparisons.

## Results and Discussion

### Genre differences

In this section, we examine whether language patterns in dissertation acknowledgments express a stronger interpersonal attitude than those in dissertation abstracts, which is a representatively more conventional form of academic writing. Since our data include abstracts and acknowledgments from the same group of authors, paired-sample t-tests were used to compare the differences in the four LIWC categories between abstracts and acknowledgments across all six disciplines (Table 2). The Kolmogorov–Smirnov test showed that the distribution of values in some cells met the normality assumption whereas others did not ($p$-values ranged from 0.000 to 0.200). Given that the paired-sample t-test is robust against the violation of normality assumption when cell sizes are equal across conditions, we proceeded with paired sample t-tests with caution. Our results showed that the acknowledgment language ($M = 79.55$, $SD = 11.89$) showed a significantly lower analytic thinking score than the abstract language ($M = 96.82$, $SD = 3.35$), $t(359) = -26.78$, $p < 0.001$. This indicates that writers tend to use a more personal and narrative style to write acknowledgments than to write their corresponding abstracts in their dissertation (see examples 1–4). This finding corroborates previous research that dissertation writers tend to recount their experience during their Ph.D. studies in the acknowledgments section (Hyland, 2004) and are likely to use first-person pronouns to express their authorial stance (Hyland & Tse, 2004).

(1) I can count on her for pragmatic advice, frank commentary, and unfailing good cheer. [HDA2416]
(2) I have been privileged to work with many amazing people who made the work in this thesis possible. [PDA5018]
(3) This dissertation treats transformations in the work processes and trade practices of the engineering industries in Britain, the United States, and German-speaking Europe over the long nineteenth century. [HAB2416]
(4) Chapter 1 situates this work in the context of the larger effort to build computational devices, and introduces the approach followed in this work. [PAB5018]

**Table 2: Descriptive statistics for genre differences across LIWC categories**

|  | Acknowledgments | | Abstract | | |
|---|---|---|---|---|---|
|  | *mean* | *SD* | *mean* | *SD* | t-statistic |
| Analytical | 79.55 | 11.89 | 96.82 | 3.35 | -26.78*** |
| Tone | 95.36 | 8.88 | 41.38 | 23.06 | 41.68*** |
| Dictionary | 75.43 | 8.79 | 71.13 | 7.23 | 7.05*** |
| Social words | 8.75 | 2.45 | 4.31 | 2.41 | 24.35*** |

*Note*: ***$p < 0.001$

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We also found that acknowledgments are more emotionally upbeat than abstracts. Specifically, the dissertation writers' acknowledgments writing received a significantly higher value in tone than ($M = 95.36$, $SD = 8.88$) that in their abstracts writing ($M = 41.38$, $SD = 23.06$), $t(359) = 41.68$, $p < 0.001$. Compared to a neutral score of 50, dissertation language is significantly more positive, whereas the abstract language is relatively neutral. This makes sense as writers were expected to express their positive feelings in acknowledgments, whereas showing a personal side of themselves is generally discouraged in abstracts. The neutral emotional tone reflected in our dissertation abstract data is consistent with previous research that showed a sober or neutral writing style in journal article abstracts in Psychology (Wheeler et al., 2021).

Writers also used a higher percentage of common words in their acknowledgments than in their abstracts, as the LIWC dictionary captures a higher percentage of words in acknowledgments ($M = 75.43$, $SD = 8.79$) than in abstracts ($M = 71.13$, $SD = 7.23$), $t(359) = 7.05$, $p < 0.001$. This is likely to be the case in that abstracts often involve academic jargons that are not included in the LIWC dictionary, whereas acknowledgments writing features everyday language. And jargons are common in both soft and hard sciences (examples 5 and 6). Since the in-built LIWC dictionary did not include people's names, names listed in the acknowledgments will not be captured by the dictionary. Consequently, our results could underestimate the overall percentage of common words used in the acknowledgments. Nevertheless, notwithstanding this confounding factor, our results still showed that dissertation writers use a statistically higher percentage of common words in their acknowledgments than in their abstracts. For example, none of the jargons that appeared in examples 5 and 6 (e.g., *thermoelectric properties* and *Bertrand competition*) were included in the authors' corresponding dissertation acknowledgments.

(5) The present dissertation investigates the relationship between the structure and thermoelectric properties of ZnO based materials. [EnAB5813]
(6) We show that our empirical findings are consistent with a search cost framework à la Mortensen, but inconsistent with other models, such as Bertrand competition, bilateral bargaining, and Cournot oligopsony. [EAB3113]

Finally, dissertation acknowledgments displayed more social processes than dissertation abstracts. This hypothesis was confirmed as a significantly higher percentage of social words were found in the acknowledgment section ($M = 8.75$, $SD = 2.45$) than in the abstract section ($M = 4.31$, $SD = 2.41$), $t(359) = 24.35$, $p < 0.001$. This finding uncovers a common practice of writers expressing their gratitude and strengthening relationships with their families, friends, and colleagues in dissertation acknowledgments (Hyland, 2003; Scrivener, 2009) (names are anonymized in example 7).

(7) Finally, the love and encouragement of my family, xxx, xxx and xxx helped get me through the toughest periods of research and writing [GDA5816]
(8) I am grateful for having many friends in these years. [BDA2117]

### Disciplinary differences

To further explore the interpersonal attitudes expressed in dissertation acknowledgments, we conducted analyses of variance (ANOVA) to compare LIWC categories across the six disciplines. The Kolmogorov–Smirnov test showed that the distribution of values in some cells met the normality assumption whereas others did not ($p$-values ranged from 0.000 to 0.200). Given that ANOVA is robust against violation of the normality assumption when cell sizes are equal across conditions, we proceeded with ANOVAs with caution. Omnibus test results showed significant disciplinary differences in values about analytical thinking, $F(5, 354) = 5.48$, $p < 0.001$, dictionary words, $F(5, 354) = 6.06$, $p < 0.001$, family words, $F(5, 354) = 3.85$, $p = 0.002$, female references, $F(5, 354) = 3.44$, $p = 0.005$, and male references, $F(5, 354) = 3.03$, $p = 0.011$. No statistically significant differences were found for tone and the sub-category of friend words (all $p$-values > 0.05). Tukey HSD was used as a post-hoc test to further explore differences between disciplines (Table 3).

The analytical thinking score for writers in history ($M = 86.09$, $SD = 7.35$) was statistically higher than the scores for writers in physics ($M = 78.10$, $SD = 14.35$), government ($M = 79.71$, $SD = 11.04$), engineering ($M = 78.87$, $SD = 9.82$), economics ($M = 75.70$, $SD = 14.17$), and biology ($M = 78.81$, $SD = 10.90$). All other disciplines did not differ significantly from each other (all $p$-values > 0.05). The statistically significant finding indicates that writers in history favor a more formal and less personal style when writing their dissertation acknowledgments. Subsequent analysis of function words

| | Biology | Engineering | Physics | Economics | History | Government |
|---|---|---|---|---|---|---|
| Analytical | 78.81[b](10.90) | 78.87[b](9.82) | 78.10[b](14.35) | 75.70[b](14.17) | 86.09[a](7.35) | 79.71[b](11.04) |
| Tone | 97.61(3.52) | 95.74(12.29) | 95.38(8.45) | 94.72(11.82) | 93.48(7.89) | 95.22(5.85) |
| Dictionary | 75.13[b](8.18) | 76.44[b](7.69) | 76.90[b](7.53) | 70.18[a](12.31) | 76.24[b](6.34) | 77.63[b](7.64) |
| Social | 8.94(2.35) | 9.37[b](2.47) | 8.57(2.95) | 8.74(2.60) | 8.09[a](1.77) | 8.76(2.31) |
| Family | 0.84[b](0.56) | 0.67(0.51) | 0.47[a](0.34) | 0.83[b](0.70) | 0.78[b](0.65) | 0.66(0.46) |
| Friends | 0.67(0.47) | 0.69(0.46) | 0.54(0.40) | 0.62(0.52) | 0.46(0.54) | 0.60(0.46) |
| Female | 0.57(0.50) | 0.49(0.43) | 0.34[a](0.42) | 0.47(0.52) | 0.68[b](0.54) | 0.45(0.46) |
| Male | 0.81(0.76) | 1.16[a](0.74) | 1.05(0.71) | 0.70[b](0.79) | 0.98(0.57) | 0.91(0.83) |

Table 3: Descriptive statistics for disciplinary differences across LIWC categories

Note: Values are means with standard deviations in parentheses. Within rows, means with different superscripts are significantly different from each other at the 0.05 level.

shows that history writers used a significantly higher number of articles (e.g., *the*) than all five other disciplines (all *p*-values < 0.05). One possible reason is that history Ph.D. awardees frequently rely on libraries and other institutional support to access historical records (Scrivener, 2009). Both the mentioning of institutions and history artifacts requires grammatical articles in written English (see examples 9–11).

(9) The Center for European Studies provided a valuable intellectual space in which to work during my early years. [HDA1118]

(10) Over lunch at the British Library, he has often recalled the details of a decades-old conversation or of a letter in the India Office Records. [HDA0618]

(11) Staff at the Center for Islamic Studies (İSAM), the Süleymaniye Kütüphanesi, the Vakıflar Genel Müdürlüğü Arşivi, the Beyazıt Devlet Kütüphanesi, the Nadir Eserler Kütüphanesi of İstanbul Üniversitesi, and the Leiden University Library allowed me many months of pleasant and productive study. [HDA2416]

In terms of common words usage, the LIWC dictionary captured a significantly lower percentage of dictionary words in economics ($M = 70.18$, $SD = 12.31$) than in physics ($M = 76.90$, $SD = 7.53$), history ($M = 76.24$, $SD = 6.34$), government ($M = 77.63$, $SD = 7.64$), engineering ($M = 76.44$, $SD = 7.69$), and biology ($M = 75.13$, $SD = 8.18$). Apart from a lower percentage among writers in economics, writers in the remaining five disciplines showed a comparable percentage of using common words in their dissertation acknowledgments (all *p*-values > 0.05). This could be attributed to the special epistemological feature of economics. A second possibility is that the length of acknowledgments in economics is shorter than those of other disciplines (see Table 1), and the LIWC dictionary does not include proper names, making its calculated percentage of common words lower than those of other disciplines.

Finally, we found that social words are significantly more frequent in engineering acknowledgments ($M = 9.37$, $SD = 2.47$) than in history acknowledgements ($M = 8.09$, $SD = 1.77$). This is likely to be the case because engineers tend to be more collaborative in their research projects, whereas historians often work on their projects independently. Tukey's HSD post hoc tests also showed that references to family in physics ($M = 0.47$, $SD = 0.34$) was significantly lower than those in history ($M = 0.78$, $SD = 0.65$), economics ($M = 0.83$, $SD = 0.70$), and biology ($M = 0.84$, $SD = 0.56$). All other disciplines did

not differ significantly from each other (all $p$-values $> 0.05$). This finding is generally consistent with results from prior research in that researchers from soft sciences (e.g., history, economics) often value emotional support from family members more than do researchers from hard sciences (e.g., physics) (Hyland, 2003; Yang, 2012). Although biology is generally considered a hard science discipline, biologists also spend time 'sit [ting] about and talk[ing]' (Becher, 1981: 111). Their sociable and colorful lifestyle is likely to manifest in their making more mentions of family members than their fellow physicists.

Moreover, male references among dissertation writers in economics ($M = 0.70$, $SD = 0.56$) were significantly lower than those of engineering ($M = 1.16$, $SD = 0.56$). In contrast, history dissertation awardees used significantly more female references in their acknowledgments ($M = 0.68$, $SD = 0.56$) than their counterparts in physics ($M = 0.34$, $SD = 0.56$). This is likely to be the case in that there tend to be more female scholars in hard sciences and more male scholars in soft sciences. Writers in other disciplines used comparable numbers of male and female references (all $p$-values $> 0.05$).

## Conclusion

In this study, we conducted a computerized text analysis of English doctoral dissertation acknowledgments across six academic disciplines. Our results showed that the language patterns identified in LIWC are valid indicators of the interpersonal features in dissertation acknowledgments. Specifically, acknowledgments display more interpersonal attitudes than dissertation abstracts which are considered a more conventional academic genre. Across academic disciplines, our results revealed that language patterns are consistent with disciplinary cultures, such as a more narrative writing style and more emotional support from families in soft sciences as well as more collaboration and/or social connection among writers in hard sciences.

Our study contributes to the existing research in three ways. First, our results demonstrated that dissertation acknowledgments as a text type need no longer be viewed as 'a Cinderella genre' (Hyland 2003). Studying the writing style of dissertation acknowledgments would offer researchers an additional angle to understand the disciplinary cultures in academic writing. Second, to our knowledge, it is the first LIWC-based text analysis of English dissertation acknowledgments. While previous

studies mainly adopted corpus linguistic methods to examine the lexico-grammatical patterns in acknowledgment writing (e.g., Chan, 2015), the present study focused on the social and psychological processes that are marked by language choices. The language patterns identified in our study could also supplement other functional approaches that seek to define the linguistic features of text types (e.g., Görlach, 2004). Finally, the increasing scholarly attention to gratitude communication in academic writing (e.g., Chan, 2015; Hyland, 2004; Tang, 2021) underscores the instructional value of incorporating acknowledgments writing in academic writing courses. The language patterns identified in our study could serve as accessible materials to help emerging scholars to better communicate gratitude to their academic societies.

Nevertheless, our findings are qualified due to the limited sample size of six disciplines from one university. Future studies could include more texts from other disciplines such as applied linguistics, chemistry, and computer science. Another limitation is that dissertation writers' language pattern is also influenced by their cultural and ethnic background. For example, people from collectivist cultures may express more collaboration and social connections than those from individualist cultures. Future studies could also explore how individual differences shape their writing styles. It is hoped that the present study can encourage more research that uses LIWC to understand the psychology of academic writing.

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