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# Writing tips for psychoneuroimmunology trainees: Lessons learned from Dr. Kiecolt-Glaser

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### ABSTRACT

Psychoneuroimmunology (PNI) researchers can advance their careers and increase their scientific impact by prioritizing their writing skills. In addition to Dr. Kiecolt-Glaser's landmark research that inspired this special issue, her legacy is reflected in her prolific writing. Dr. Kiecolt-Glaser has the unique ability to convey her innovative research clearly and to diverse audiences. She also made writing mentorship a critical part of the training experience in her lab. In these ways, Dr. Kiecolt-Glaser's writing skills and mentorship have shaped both the PNI field and her trainees' careers. In this paper, I distill lessons learned about writing from Dr. Kiecolt-Glaser during my time as a graduate student in her Stress and Health Lab in the 2010s. I reflect on Dr. Kiecolt-Glaser's influence on her trainees' writing habits, summarize "writing pearls" inspired by her feedback/revisions, and provide observations on her writing mentorship habits. These tips are intended to help PNI trainees to clearly communicate their work and to help mentors reflect on ways they can prioritize and advance their trainees' writing skills. Finally, I reflect on how Dr. Kiecolt-Glaser's mentorship and scientific accomplishments had a tremendous impact on my own career development.

As a graduate student in Dr. Jan Kiecolt-Glaser's Stress and Health Lab, receiving feedback on a draft manuscript, proposal, or thesis typically went something like this:

I submit my draft, relieved to reach a milestone and eager to take a break. Sooner than I expect, I see an email from my advisor, Dr. KG, in my inbox. This shortens my break. I open the email, and press "play" on the attached Windows Media file. The file begins in her familiar voice "Hi Heather ...". I picture Dr. KG sitting down to read my most recent draft, produced after many hours of work. My stomach churns a little, and I brace myself for her feedback. Does her tone seem upbeat? Displeased? The first time listening to an audiotape could be nerve-wracking. I listen to it once, then take a break to process her feedback, and come back to make edits later. I also pick up the accompanying marked-up hard copy with its colorful felt-tip notes from outside her office - either with pride, a slightly bruised ego, or both.

Dr. Kiecolt-Glaser is a prolific writer. She shaped the psychoneuroimmunology (PNI) field with her ability to convey her innovative research clearly and to diverse audiences, with over 300 publications that have been collectively cited more than 75,000 times. Stress and Health Lab trainees benefited not only from her clear scientific accomplishments, creative research methodology, and wise career development advice; Dr. Kiecolt-Glaser also had a large impact on her trainees' writing. In this commentary, I reflect on Dr. Kiecolt-Glaser's influence on her trainees' writing and summarize "writing pearls" inspired by her mentorship.

### 1. Building a writing habit

Dr. Kiecolt-Glaser recommended to approach writing similarly to other targeted behaviors: develop a habit. This mirrored her approach to other aspects of her work lifestyle, like reducing sedentary time. As any renowned scientist would do, she consulted the research literature. She swore by daily writing, a method tested by Dr. Robert Boice. For example, compared to new faculty members who engaged in "binge writing," those who wrote in brief, regular sessions had higher writing productivity, took less time to "warm up," had more creative ideas, and experienced fewer negative emotions around their writing sessions [1]. Dr. Kiecolt-Glaser's routine involved writing in short bursts, ideally in the morning. As much as possible, she structured her meeting schedule to allow for uninterrupted writing time before other tasks. This reflected her strong prioritization of writing first, before emails and meetings took off for the day.

She also suggested ways to remove barriers to initial drafting or freewriting. These tips maximized writing efficiency and combatted the hesitance that many writers feel when looking at a blank page. For example, she reminded her trainees: Do not worry if it sounds good the first time it comes out; you first need something to work with and can

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edit later. When reading an article, type up a short summary (2–3 sentences or phrases) in your own words. This can be used in your future writing, gives you a head start, and saves time that you would likely spend refreshing your memory later. Try dictation to voice your ideas and help get words on paper. While Dr. Kiecolt-Glaser used special dictation programs, free versions of speech-to-text technology can work well.

### 2. Writing style

Dr. Kiecolt-Glaser's clear stylistic preferences are evident from her audiotapes, her own writing, and her trainees' writing. These preferences are not arbitrary; they aim to increase clarity, precision, readability, and impact. Given the highly interdisciplinary nature of PNI work, it is critical to write in a way that is accessible to readers from multiple fields. Table 1 lists my interpretation of Dr. Kiecolt-Glaser's "writing pearls," based on many rounds of audiotaped feedback and discussions in our graduate student/post-doctoral trainee meetings.

### 3. Mentoring on writing

Dr. Kiecolt-Glaser evaluated writing potential as a criterion during hiring decisions, and made it a priority training item in her lab. It is no surprise that her mentees, including those who contributed to this special issue, continue to produce strong, highly-cited articles. Table 2 summarizes my observations of Dr. Kiecolt-Glaser's writing mentoring habits. I believe these contributed to what made her a wonderful mentor, and these are among the habits I strive to emulate. Mentors can model these strategies to promote strong writing in their trainees, and

trainees can look for these habits in potential mentors to ensure a supportive environment for their writing.

## 4. Reflection: Dr. Kiecolt-Glaser's impact on my career development

Simply put, Dr. Kiecolt-Glaser had a tremendous impact on my career. Her mentorship on writing and research conduct, along with her scientific accomplishments, helped to facilitate my transition from a graduate student to postdoctoral fellow to faculty member and independent researcher. It was clear that she mentored with the end goal in mind – to equip her trainees to launch their own research programs.

With respect to writing mentorship, her support for trainee-led publications greatly strengthened my ability to obtain future positions. Her encouragement (and expectation) to publish from rich datasets and to lead and/or contribute to review papers led to both fantastic training opportunities and a competitive CV. When I applied to postdoctoral and faculty member roles, I am confident that my applications received a second-look in large part because of the publications Dr. Kiecolt-Glaser urged me to lead as a graduate student. Guided by her audio-taped feedback on manuscript drafts, I could also write much more clearly when I graduated from her lab than when I arrived. This also laid the groundwork for me to grasp publication opportunities as a postdoctoral fellow.

Further, the writing lessons from Dr. Kiecolt-Glaser's lab provided a strong foundation for learning to write grants. It was helpful that Dr. Kiecolt-Glaser shared her grants with graduate students and involved them in the editing process. Because I had seen examples of her successful grants, I entered my postdoctoral fellowship ready to capitalize

Table 1
Writing "pearls" for PNI trainees inspired by Dr. Kiecolt-Glaser's mentorship.

Recommendation	Description
Use an active voice.	Include active verbs as much as possible. This makes your writing more to-the-point, interesting, and easier to read. Using passive verb structure like "was correlated" or "is related to" is sometimes necessary, but diminishes the impact of the statement.  Example:  Initial version: "Marital problems are associated with poor health."  Better version: "A troubled marriage can negatively impact health."
Make your point in fewer words.	When possible, use the shorter version of sentences to emphasize the take-home message. For example, avoid over-using phrases that add length without value, such as "Research shows that" or "this has been shown to" Typically, these phrases can just be cut out to make the sentence more powerful. Another strategy is to practice cutting prepositions. This saves words and makes your writing easier to follow.  Examples:  Initial version: "Research has shown that chronic stress promotes inflammation."  Better version: "Chronic stress promotes inflammation."  Initial version: "Research on the psychological states of healthy adults during the aging process"  Better version: "Healthy older adults' psychological states"
Simplify technical phrasing when possible.	Trainees often heard Dr. Kiecolt-Glaser say, "Speak in English." By this, she did not mean to avoid other languages - she meant to avoid jargon. After reading a jargon-filled sentence in my draft, she would often ask rhetorical questions like "Would you really say that in a conversation?" I can't tell you how many times her audiotape feedback reminded me "I don't think you'd say that to someone." This reminds us that we can often improve our writing by asking ourselves "Will others outside of my specialty field know what I'm talking about?"
When possible, write about the people, rather than the variables.	Focus on "people" or "who" when describing study results. At times, describing the statistical tests and variables is necessary, and may be preferred in the Results section. However, especially in the Discussion section, illustrate the meaning of your results by emphasizing the pattern according to participants (or animals) and people overall.  Examples:  Initial version: "Regression models showed that depression was negatively associated with diet quality."  Better: "Depressed women reported poorer diet quality than women who were not depressed."
Be careful not to overstate or understate study conclusions.	Dr. Kiecolt-Glaser modeled the delicate balance between describing your results impactfully, without going beyond the data. I remember that the type of feedback I found painful was when she would say "I don't think the literature supports that" or "That's not actually what you showed here." Dr. Kiecolt-Glaser was also aware of gender differences and/or biases that influence how scientists convey their work [2]. For example, women researchers were less likely to describe their findings positively (using words like 'novel') in high-impact journal articles compared with their male counterparts; this pattern was associated with lower citations for articles led by women [3]. To that end, Dr. Kiecolt-Glaser was also quick to point out when a trainee was understating their results.
Read your drafts <u>aloud</u> to yourself to help catch errors and awkward wording.	Before sending a draft for her to review, Dr. Kiecolt-Glaser recommended that trainees read their draft out loud to themselves. When I did this, I always caught typos and phrases that just did not sound natural when spoken aloud.

**Table 2** Effective writing mentorship habits inspired by Dr. Kiecolt-Glaser's mentorship.

Recommendation	Reflection
Prioritize mentorship on writing.	In weekly graduate student/post-doctoral trainee meetings, Dr. Kiecolt-Glaser made the writing process a topic of discussion. As part of our weekly update, we were often expected to answer "Have you been doing daily writing?" Along with other assigned PNI-specific reading, she assigned chapters about writing [4,5] for discussion during trainee meetings.
Encourage trainees to lead first-author manuscripts.	Dr. Kiecolt-Glaser encouraged doctoral and postdoctoral trainees to lead publications. She urged trainees to use the lab's rich, previously-collected datasets for secondary analyses addressing their unique research interests (outside the project's primary aims). For example, using data from a trial that tested yoga's effect on breast cancer survivors' inflammation, mood, and fatigue [6], I conducted secondary analyses to explore yoga's effect on self-reported cognitive problems, leading to a first-author publication [7]. When she received a journal's invitation for a review paper, she often opened this opportunity for a trainee to lead the manuscript as first author under her guidance as senior author. These practices helped build trainees' writing skills and CVs.
Involve trainees in providing writing feedback.	Graduate students were expected to share their early drafts with each other and with post-doctoral trainees for initial feedback, prior to circulating it to Dr. Kiecolt-Glaser. This gave an opportunity to obtain initial input and address rough areas, so that her own feedback could be more targeted. This also encouraged trainees to practice giving feedback and strengthened their own writing mentorship skills. In addition, she asked for trainees' input on her drafts as relevant, which modeled how to receive and integrate feedback and normalized the revisions process.
Return feedback quickly.	Dr. Kiecolt-Glaser reviewed trainees' work in a timely, efficient manner. She was never the "bottle neck" in a paper's progress. Sometimes, it even felt too efficient - I would be looking forward to taking a break from a paper, only to have her audiofile in my inbox (and marked-up hard copy outside her door) the next day.
Use audiotapes to provide feedback.	She recommended using this practice primarily because it saved time, compared to typing line-by-line comments and edits. It also allowed her to easily describe why she was recommending a specific change. As a trainee, the tapes could be a little intimidating to listen to at times. However, I ultimately found the audiotapes to be very helpful. I could hear not only the suggested change, but the tone, degree of importance, and rationale.
Keep learning about writing.	Dr. Kiecolt-Glaser had fun with writing. She took a fiction-writing course and produced two novels (with a psychologist main character, of course [8,9]). She described this process as enjoyable, and I believe it made her a stronger writer and mentor as she maintained an openness to learning.

on additional grant-writing training. My first funded grant, an American Psychological Foundation grant to measure proinflammatory cytokines in an ongoing study of older adults with HIV, brought together biobehavioral research insights from Dr. Kiecolt-Glaser's lab with post-doctoral opportunities [10,11]. Taken together, these examples highlight how Dr. Kiecolt-Glaser's influence set the stage for me to progress from conducting to leading projects during the next stage of my career.

Soaking up lessons about research conduct and lab management from Dr. Kiecolt-Glaser also supported my ability to lead research studies and establish my own lab. By the time I joined her lab as a graduate student in 2010, Dr. Kiecolt-Glaser had perfected the productive infrastructure needed for successful biobehavioral projects. There were clear, well-organized processes for staff training, participant recruitment, study visits, collaborations, data collection, and data integrity. This lab infrastructure made it possible for robust analyses and writing to occur. While setting up and growing my own lab, I often reflect on the processes led by Dr. Kiecolt-Glaser and her talented lab manager, Michael Di Gregorio, MS, CCRP to help me build a strong team and study infrastructure.

Dr. Kiecolt-Glaser's scientific accomplishments, as well as the "roots" of my interests that she supported in graduate school, informed early directions of my research program. During the time I was in her lab, Dr. Kiecolt-Glaser's studies focused on inflammation and cancer. Her work was on the cutting edge of establishing bi-directional relationships between depression and inflammation [12], understanding how psychosocial, lifestyle, and clinical factors impact stress reactivity and inflammatory responses [13,14] (including directions co-led with her mentees [15-17]), and testing how interventions could reduce chronic inflammation and cellular aging [6,18,19]. She encouraged my involvement in these directions [20,21], as well as complementary interests in cognitive function [7,22]. Working with women with breast cancer, particularly as they began active treatment, sparked my interest in the complex inter-relationships between physical, mental, and cognitive symptoms among those with cancer and related chronic illnesses

As an early career investigator, Dr. Kiecolt-Glaser's findings continue to guide my current work. My research program involves (1) applying

established pathways between stress, depression, and inflammation to new contexts/populations, in order to learn how psychosocial factors impact health and functioning, and (2) translating these findings toward intervention. For example, Dr. Kiecolt-Glaser's scientific contributions demonstrate that depression and other psychosocial factors predispose people to chronic inflammation and exaggerated inflammatory responses to stressors and immune challenges [12,23]. In my recent research, I have applied these connections in the context of aging with HIV, living with advanced cancer, and receiving immunotherapy, to determine whether people with psychosocial risk factors experience higher inflammation and/or poorer health outcomes than those without these risk factors [10,11,24,25]. I am also applying laboratory-based PNI and behavioral science findings to guide the basis for interventions. For example, based on experimental studies showing stress impacts cognitive function [26], I examined whether anxiety may impact patients' understanding of information discussed in clinical visits [27]. We showed that advanced cancer patients with higher anxiety had less accurate understanding of their recently-discussed scan results than those with lower anxiety [28]. To build upon these findings, my lab is adapting and pilot testing a stress management intervention for patients with advanced cancer around their cancer scans, a particularly stressful time period [29]. In the long-term, we plan to test whether helping patients manage scan-related anxiety also improves their understanding of and engagement in high-stakes clinical appointments, a possibility suggested by laboratory-based behavioral science [27].

For each of these research directions, roots of my interests began in graduate school, inspired by Dr. Kiecolt-Glaser's interesting work and related clinical experiences. These research interests were nurtured by the ability to examine data, gain writing skills, and publish on relevant questions during my time as a graduate student in the Stress and Health Lab. Dr. Kiecolt-Glaser's mentorship created the right conditions for me to capitalize on these opportunities in the subsequent steps of my career, and to propose and lead projects as an independent investigator. Finally, lessons from Dr. Kiecolt-Glaser also prepared me for encountering the challenges that inevitably arise in research careers [2,30]. For example, she instilled persistence and resilience in the face of unfunded proposals. When I've been in a "writing rut" during transitions in professional or personal life, short daily writing bursts (her recommended routine) play

a large role in pulling me out and getting me back on a productive path.

### 5. Conclusions

Dr. Kiecolt-Glaser continues to impact the PNI field through her high-impact publications, others' research inspired by those publications, her unique writing style, and her influence on trainees' writing and careers. As intimidating as it sometimes was to receive audiotapes of Dr. Kiecolt-Glaser's feedback as a graduate student, I find myself missing them now. It was incredibly helpful to have this direct sense of what she thought of my writing - even (or especially) when it was constructive criticism. I wonder what she'd record in her feedback for this manuscript. It was truly a unique opportunity to learn about scientific writing directly from her. By distilling these lessons learned from her writing mentorship, my hope is that it helps other trainees and mentors to clearly communicate their work - a critical skill for increasing the reach and impact of our science.

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**Heather Derry-Vick:** Writing – review & editing, Writing – original draft, Conceptualization.

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