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A PERSONAL VIEW

We, um, have, like, a problem: excessive use of fillers in scientific speech

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Abstract

A filler is any word or sound that interpolates (i.e., is inserted into) the main message of a speaker. Common fillers include "um", "ah," "like," "so," and "you know?" among others. Excessive use of fillers in scientific presentations can reduce the credibility of the speaker as well as impair the comprehension of the speaker's message by the audience. Primary causes of fillers include nervousness/speaking too quickly, inadequate preparation time, and infrequently used words that are difficult for the speaker to remember while presenting. Recommendations for reducing the use of fillers include self-awareness of the problem, reinforcing feedback, and active intervention to render pauses silent (instead of verbal) by "chunking" content, increasing preparation time, and slowing presentation pace. Excessive use of fillers is an obstacle to becoming an effective public speaker, and therefore, efforts to reduce filler use should be a goal of professional development.

NEW & NOTEWORTHY Although many articles exist on the use of filler words during public speaking, to our knowledge this is the first comprehensive discussion of the issue in the context of scientific presentations and speech in biomedical research. This Personal View discusses the problem of excessive filler use, the underlying causes, and tips for reducing fillers based on a combination of available literature and personal advice from a laboratory with nearly 40 years of experience in mentoring.

oral presentation skills; professional development; public speaking

Over the past 37 years, almost 300 students and postdoctoral investigators have received academic research training in our laboratory (1, 2). That many mentees conducting original research and engaging in a variety of career development activities necessitates a great amount of interaction, including a good deal of formal or, at least, semiformal scientific communication. These settings include research project updates and science highlights presented in our weekly laboratory journal club, trainees preparing presentations for upcoming research conferences, postdoctoral investigators practicing invited seminar presentations, and so on. In addition, faculty from campus and visiting professors present their work in our weekly department seminar series, and scientific speech is a fundamental component of instruction at both the undergraduate and graduate levels. As such, in our daily work environment (and those of other laboratories), one is continually exposed to several forms of scientific communication.

Based on this large sample size of observations, we believe that when it comes to scientific speaking, we, um… have, er… a problem. Like, a big problem, you know? If you are unaware of this problem, then speaking for those of us who are all too conscious of the issue, we are envious. The problem in question is the excessive use of "fillers." A filler is any word or sound that interpolates (i.e., is inserted into) the main message of a speaker (3). These sounds, words, and phrases "fill" pauses in speech. Examples of commonly used fillers are listed in Table 1 (3–5).

Some authors refer to fillers as filled pauses, rather than silent pauses. However, for simplicity, we will use the term "fillers," as previously recommended (4). Below we address three major components of filler use in contemporary scientific speech.

THE PROBLEM WITH FILLERS

What exactly is the problem with using fillers during scientific presentations? One major school of thought views fillers as a "speech disfluency," defined as anything that disrupts normal patterned speech (3). Indeed, formal courses on public speaking train people to speak without the use of fillers (4). This instructional goal is consistent with the fact that the presentations of top public speakers typically are void of fillers (6). For example, it has been noted that between 1940 and 1996 U.S. presidential inaugural speeches did not include a single uh or um (6).

The major problem with fillers in speech is not their occasional use, but rather their excessive use (4, 5). For example, a study on success in telemarketing identified a tipping point for filler use (7). Specifically, success rates dropped in proportion to the number of filler words used during a phone call, especially after use exceeded 1.3% of total words. To explore this foundational issue in more depth, we discuss several aspects of the problem in the following section.

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Table 1. *Commonly used fillers in speech*

Filler Type	Common Examples
Sounds	"Um," "ah" ("uh"), "er"
Words	"And," "like," "so," "okay," "sorry," "well," "but," "right?"
Combinations of words	"And so," "you know" (or "ya know"), "I think"

Impact on Speaker Credibility

Fillers have potentially negative implications for optimal career development and professional success in biomedical research. There is evidence that greater use of fillers reduces the credibility of a presenter compared with less frequent use (5) (Fig. 1). For many listeners, repeated use of fillers such as "um" and "so" is interpreted as a form of verbal stumbling that manifests when a speaker is unsure of themselves (8).

Fillers also can be viewed as violations of the "preference for progressivity" (9). In speeches, including scientific presentations, the audience is intrinsically oriented toward progressivity, i.e., the forward progression of the message being delivered. Fundamentally, filler words impede the progressivity of the message by interrupting or delaying what should naturally follow (9). This is, therefore, another mechanism through which excessive use of fillers negatively affects the oral presentation performance and the audience's impression of the speaker.

Effect on Audience Comprehension

Excessive use of fillers also distracts the audience and can limit optimal comprehension of the message (Fig. 1). When a filler is inserted every few words it is difficult for audience members to concentrate, hold interest, and absorb the presenter's key points (3, 5). As the audience becomes increasingly aware of a speaker's frequent use of fillers, they may begin to track the filler words instead of focusing on the important scientific content of the presentation. For some, listening to a presentation littered with fillers, sometimes referred to as "word parasites," can be highly irritating and cause near complete distraction from the presentation message (10). Filtering out a continuous stream of fillers requires more cognitive effort than most individuals in an audience are willing to invest, making it more likely that they will instead tune out and think about something else; it is simply too difficult to concentrate on the major concepts being advanced (5). The risk of this occurring is likely even greater if the speaker is presenting on a topic outside an audience member's area of interest, which is often the case in conventional seminar settings. At that point, the speaker has essentially defeated the primary purpose of their talk and has lost the time and effort spent developing and practicing the presentation, an unfortunate casualty to what is typically an unconscious and often resolvable behavior.

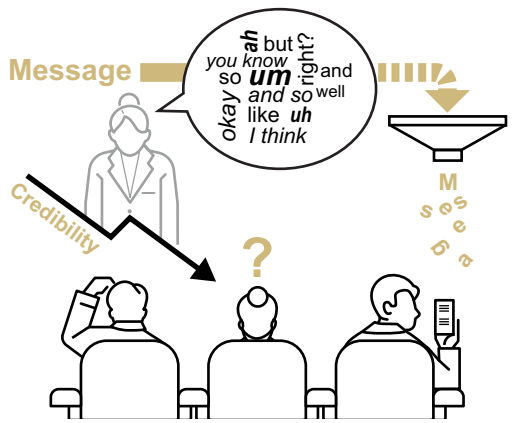

Figure 1. The problem with fillers. Excessive use of fillers in oral presentations reduces both speaker credibility and audience comprehension. Listeners must attempt to filter out the intended message from all the fillers, making it difficult to focus on the scientific content and leading to loss of audience interest.

ETIOLOGY OF EXCESSIVE FILLER USE

How did we get to the present "filler-centric" state of speech in the biomedical sciences? In this section, we discuss several possible reasons for the widespread excessive use of fillers in contemporary scientific speaking.

Emphasis on Conversational Speaking

One hypothesis is that the current emphasis on extemporaneous presentation styles (more natural, "conversational" speaking), in contrast with previous practices of reading from a script or memorization-based delivery, is a contributing factor because fillers are prominent features of contemporary conversational speech (11). In other words, we are encouraging our trainees to speak conversationally and perhaps they take that advice literally, allowing common signatures of everyday informal communication to permeate their presentations.

It Is Natural (and Helpful) to "Pause"

A more foundational consideration is that speech is never continuous (fluent) in its most basic form (12). For example, all speakers must breathe, which necessitates regular pauses. Moreover, rhetoric (efforts to create impressive or persuasive speech) uses "hesitation phenomena," including silent pauses, repeated terms, prolongations of words, and other tools, to be effective (12). Importantly, listeners also benefit from the natural pauses in speech because it allows them periodic breaks to process what is being said, thus improving cognition (12). As such, breaks in speaking may be considered both organic and potentially helpful. It is the use of fillers (vocalized sounds and spoken words/phrases) during those pauses that represents the root of the problem.

Filling the Void with Fillers

What causes speakers to fill the void with fillers instead of silence? As is the case with most problems, understanding the root causes may provide clues to potential solutions. Several hypotheses have been advanced and are briefly summarized here (Fig. 2).

Nervousness/speaking too quickly. Glossophobia is the anxiety associated with public speaking (3). This anxiety often causes speakers to seek to complete

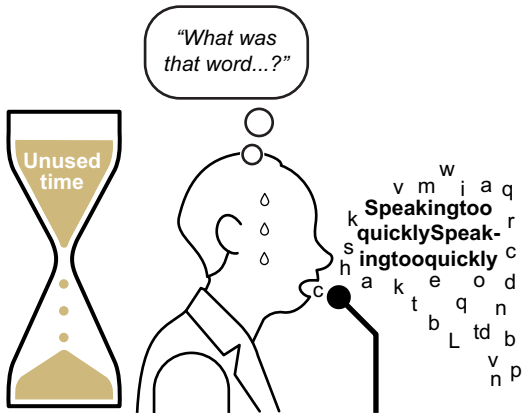

Figure 2. Causes of excessive filler use. The main causes of excessive use of fillers in oral presentations are as follows: *1*) nervousness/speaking too fast (*middle* and *right*); *2*) inadequate preparation, e.g., because of unutilized potential practice time (*left*); and *3*) difficulty in identifying infrequently used words during the presentation (*top*).

their presentation as soon as possible to limit the period of nervousness (get off the stage), and as a result, they speak quickly, too quickly. The overly fast speaking pace increases the likelihood of introducing speech disfluencies, including heightened filler use (3, 10). This occurs because when presenters are speaking too quickly to properly process speech, it is more difficult to identify the next word, phrase, or statement. In these situations, speakers tend to fill the search period with vocalized pauses in the form of fillers. Ironically, continuous use of fillers can cause "filler-sensitive" members of the audience to become disinterested. If noticed by the speaker, this may lead to even greater nervousness, further increasing speaking rate and filler use in a vicious cycle (5).

Inadequate preparation time.

Inadequate preparation or practice time also is believed to play an important role in the use of fillers during formal speech (10). Without adequate preparation, statement-to-statement transitions are not properly established, increasing uncertainty and use of fillers as the presenter seeks to remember their next point (8).

Infrequently used words.

This potential cause of filler use refers to situations in which the speaker is attempting to employ rarely used words in their narrative speech. The idea is that while searching for an unfamiliar term a speaker is much more likely to use fillers as a bridge until the target word is identified.

The Systemic Nature of the Problem

These putative causes of excessive filler use might lead the reader to assume this speaking behavior is largely, if not exclusively, confined to early career presenters. Although this trait may be more prevalent in inexperienced speakers, it is certainly not restricted to that demographic. Indeed, discerning listeners of conference symposia and faculty seminar series undoubtedly have heard presentations by many senior investigators who engage in excessive use of fillers. This is certainly a regular feature of our department colloquium program. Recently, a professor with more than 30 years of experience presented a 45-min talk that was chock-full of ums, ahs, and other common fillers: 20 in the first 5 min alone, which extrapolates to 180 for a full presentation. This common observation suggests that excessive use of fillers during scientific speaking is a systemic problem in our field, rather than simply being limited to research trainees and junior investigators.

RECOMMENDATIONS FOR REDUCING THE USE OF FILLERS

When the first author of this commentary was in his first faculty position many years ago, he presented a department seminar after which a colleague mentioned privately that the speaker used a particular filler during every natural pause in the presentation ("ah" if memory serves correctly). The colleague suggested that the speaker make those pauses silent. The speaker was unaware of his excessive use of fillers and was determined to eliminate all use of fillers from future presentations (which, fortunately, he was able to accomplish with practice). If it was not for that concerned colleague's willingness to make an awkward point to a young investigator, the behavior may have gone uncorrected. This personal anecdote serves as an example of the problem and the potential to correct it when identified. In this spirit, below we offer several evidence-based recommendations for reducing, if not eliminating altogether, the use of fillers in scientific presentations (Fig. 3).

Awareness

As the above anecdote reinforces, the first step in changing any behavior is awareness (5, 13). Speakers can be made aware of the use of fillers simply via the helpful observation and sharing of a colleague or mentor. The limitation of that approach is the reluctance of colleagues (and many mentors!) to bring the problem to the attention of individuals with the habit. Another approach is for speakers themselves to take the initiative to review a recording or transcript of

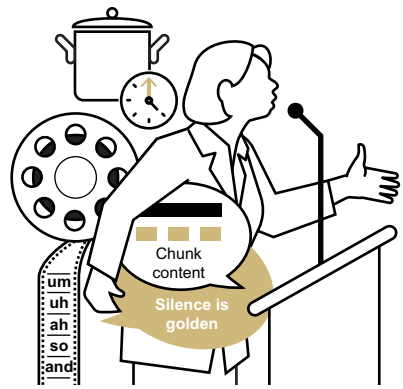

Figure 3. Recommendations for reducing filler use. Recommendations for reducing the use of fillers during presentations include the following: *1*) awareness of filler use by recording and analyzing presentations (*left*); *2*) increasing preparation (practice) time (*top*); *3*) "chunking" content with statements followed by natural pauses (*middle*); and *4*) maintaining silence during pauses i.e., "Silence is golden" (*bottom middle*).

their presentations or ask a colleague to watch the presentation and count the number of fillers used (5, 10).

Recently, our laboratory has instituted a professional development exercise in which research trainees review recordings of their own presentations in our weekly laboratory meeting/journal club. The mentees are asked to count the number of filler words and calculate the percentage of filler to total words and share that information with their mentor(s). Presenters also are asked to identify other (nonfiller related) aspects of their presentations in need of improvement to enhance performance. This pilot program, which has been in effect for only a few months, has resulted in remarkable, uniform improvements in oral presentation performance among the research trainees in the laboratory. The trainees have embraced the exercise because the improvements in their presentation skills are clearly apparent. As a result, we will continue the program indefinitely and highly recommend this strategy to trainees and their mentors throughout the biomedical sciences.

Feedback and Reinforcement

One recommendation is that upon being made aware of your use of fillers, you pair their use with reinforcing actions such as tapping your leg when you catch yourself using a filler or have someone in the audience clap or snap their fingers (rapping knuckles on the table also would work) (5). Another approach is to recruit a "filler counter"—a colleague, friend, or family member who is willing to record the number of fillers during practice sessions (10). Results of studies support the effectiveness of these and other types of feedback-based interventions, including use of immediate feedback paradigms, in reducing fillers (11). As emphasized in the preceding section, self-analysis of recorded presentations also can provide highly effective feedback and reinforcement for reducing filler use and improving overall performance.

Intervention: Silence Is Golden

The next step is intervention—working toward remaining silent during pauses. Practicing silence instead of using vocal fillers and checking progress objectively by recording and reviewing your presentations is one recommended approach (5). When encouraging early stage research trainees to maintain silence during pauses in speech, many will say that they perceive such nonverbal periods as prohibitively long. However, brief, silent pauses tend to be interpreted by the audience as demonstrating confidence and control of your presentation. This is in contrast with the use of fillers, which can be distracting and interpreted by listeners as the speaker lacking command of the narrative (5). Indeed, research trainees in our laboratory who have reviewed their recorded presentations conceded that when they employed silent pauses (instead of fillers), those nonverbal periods did not sound uncomfortably long, but rather, appropriate and effective. Next, we share several tactical approaches to consider for reducing filler use in scientific presentations.

"Chunk" your content.

The recommendation here is to organize your presentation in a manner that naturally reduces the use of fillers. Specifically, try to "chunk" presentation content such that a statement is followed by a natural pause, which prevents rambling speech and reduces the need for a filler (8). Keep your sentences short with silent pauses between statements. Consider using effectively placed content (e.g., introduced via step-in animations) as one tool to help you organize and sequence your content chunks to reduce filler use.

Increase your preparation.

Increase preparation efforts to reduce nervousness—a major cause of excessive filler use (3, 5). Additional practice will facilitate your ability to identify the next point to be made and articulate your message without the need for fillers (5, 8). Below are a few specific suggestions for improving your preparation to reduce filler use.

Practice your transitions. Practice transitions until every segue between statements is well established throughout the presentation. Indeed, the first author of this perspective practices transitions until he has firmly established every segue between statements throughout the presentation (dozens or more transitions depending on the length of the talk). Another suggestion is to create some generic transition statements that can be used instead of fillers in case you lose track of your pre-practiced transitions (8). These would include phrases such as "let's move to" or "another important consideration is."

Practice the overall presentation. It also is helpful to have some sense of the total preparation time that should be allocated to a presentation. Carmine Gallo, a keynote speaker, author, and communication advisor, recommends practicing the entire presentation until you can deliver it effortlessly—at least 10 times, with some speakers needing more and some requiring less practice (13). Jill Bolte-Taylor notes rehearsing an 18-min TED talk ("Stroke of Insight") 200 times, a presentation that has become one of the most popular TED talks ever recorded (13). One recommendation is to spend 1 hour practicing for every minute of your presentation (5). Although certain commentary in the popular press suggests that it is possible to "over prepare," this sentiment does not appear to be based on compelling, if any, scientific evidence.

These examples and recommendations aside, the amount of practice time required will depend on several factors, including the formality of the presentation (e.g., a research project update in a laboratory meeting versus an abstract presentation at a scientific conference), whether the speaker has given the presentation before, the overall presentation experience of the speaker, their familiarity with the content being shared, etc. Ultimately, the key is to find a practice routine that consistently results in the best performance for you and continue to improve your preparation approach over time.

Spend extra time on the tricky segments. Identify specific parts of the talk that are difficult to articulate cleanly and spend more time on those challenging passages until you can present them as smoothly as the more intuitive parts (5, 14). Sometimes simplifying the wording of the section in question can greatly simplify the narrative, lessening the challenge and pressure to resort to the use of fillers.

Practice in front of others. The suggestion here is to practice in front of others, particularly mentors and peers, whenever possible. This approach increases confidence,

reduces nervousness, and consequently decreases the use of fillers (3, 13, 14).

Slow down! As mentioned earlier, nervous speakers tend to speak too fast, resulting in cognitive processing limitations and increased use of fillers. An overly fast speaking pace also makes it difficult for the audience to fully comprehend your story. Therefore, practice speaking at a slow, deliberate pace—a conversational pace (e.g., 140–170 words per minute). To that point, it is remarkable that, when asked, trainees almost uniformly state that while practicing and giving their presentations their speaking pace sounds appropriate to them, but upon reviewing recordings of their presentations, they perceive their pace as clearly too fast. Accordingly, we recommend that you record your practice sessions to self-check your pace or, when practicing in front of others, ask them if your speaking rate seemed effective. Finally, consider listening to the pace used by speakers that you find effective and try to emulate their approach. Main takeaway: slow down to decrease filler use and increase audience comprehension and engagement!

Practice maintaining eye contact and other visual forms of communication. Maintaining eye contact with the audience while presenting has been linked to less frequent use of fillers (8). You also can leverage body language by using gestures (e.g., nodding, shrugging, or pausing to take a drink of water) or facial expressions (e.g., reflecting surprise or uncertainty) to maintain communication with your audience during pauses in speech (15). These mannerisms give speakers time to collect their thoughts during a pause without resorting to use of fillers. Finally, when no listening partner is available, rehearsing in front of a mirror can be a helpful alternative that allows you to practice in a manner that facilitates making eye contact with the audience (you, in this case).

Filler use when responding to questions.

Using a filler has been described as "thinking verbally"; in other words, you are verbalizing your thought process (5). If you remain silent during a pause you cannot use a filler. The silence guarantees elimination of fillers. To reduce the use of fillers when responding to questions, it is recommended that you pause and carefully consider your answer before attempting to respond (10). Having a well-formulated answer will reduce the need to search for words and should result in less filler use. Moreover, it is okay to admit that you do not know the answer rather than attempting to manufacture an awkward, unnatural response. Finally, prepare for questions from the audience through the following strategies (16):

- Seek questions from your colleagues during and after practice sessions—ask them what questions came to mind as you spoke;
- Ask your mentor what questions they recommend you prepare for; for example, what questions have other trainees received when presenting the laboratory's research on the general topic of your presentation;
- Review the literature related to your presentation topic to identify any controversial aspects of the science that may naturally lead to audience questions;
- Consider the research interests of the individuals who will make up the expected audience; for example, if the audience will include investigators engaged in clinical research, they may ask you about the translational potential of your work or perhaps it is a national meeting and you expect other investigators who have published on your topic, but obtained different results, to challenge your findings on certain points; and
- Be prepared to address questions regarding the types of research efforts that should be prioritized in the future on your topic.

Make It a Professional Development Goal

Consider making elimination of fillers a goal for optimal career development. Beyond delivering a polished presentation to the audience in the room, becoming an effective public speaker translates to other critical professional skills and opportunities for scientists. These include but are not limited to enhanced networking capability, stronger collaborative interactions, improved teaching performance, more effective mentoring, increased invited speaking opportunities, and greater general communication skills.

Trainee and mentor responsibilities.

For research trainees, adopting this career development goal means devoting the necessary time and energy to improving your speech fluency, including minimizing filler use. For their part, mentors must support these efforts by *1*) monitoring the oral presentation performance of their trainees and bringing weaknesses, including excessive filler use, to their attention instead of accepting poor speaking skills as simply a commonly observed limitation of mentees at that stage of training; and *2*) providing structured opportunities for trainees to improve their public speaking abilities via regularly scheduled presentations in weekly laboratory meetings, journal clubs, graduate courses, departmental trainee seminar series, or other vehicles (16). Mentors also can help trainees by maintaining high professional standards for scientific speech within the laboratory environment, including for their own (the mentor's) presentations, and dedicating time during both individual mentoring sessions and whole-laboratory meetings to development of oral presentation skills.

One step at a time.

When emphasizing improved public speaking skills in the context of professional development, it is important to remember that it is not necessary to eliminate filler use in an initial effort but rather to reduce the frequency of use as a first step and then progressively work toward elimination. It also is important to recognize that improving public speaking skills, including reducing use of fillers, may be more challenging for certain individuals and groups. For example, some individuals whose first language is not English initially might find it challenging to present in that language. Similarly, some trainees with disorders of fluency, such as a stutter, and others with a fear of public speaking might need additional guidance, time, and space to improve their oral presentation skills. The reality is, all trainees and faculty, regardless of circumstances and level of training, benefit from empathy, mentoring, encouragement, and opportunities to enhance their scientific speech and public speaking abilities.

FILLERS: THE BOTTOM LINE

Public speaking is a critical professional skill, and therefore, excessive use of fillers represents a threat to becoming the most effective scientist you can be (1, 2). If you wish to be a consummate professional in your field, target reducing or, better yet, eliminating the use of fillers during scientific speaking. If you can create the personal agency necessary to master technically difficult experimental skills, you certainly can generate the energy and focus required to break the filler habit.

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AUTHOR CONTRIBUTIONS

D.R.S. and M.E.C. prepared figures; D.R.S. and M.E.C. drafted manuscript; D.R.S. and M.E.C. edited and revised manuscript; D.R.S. and M.E.C. approved final version of manuscript.

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