# Micro-writing Techniques to Maximize Clarity in Scientific Writing

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## School of Nursing Research Seminar

## February 6, 2017

# Make Clarity Your Priority

"Some readers might think you're smart if your writing is impenetrable, but you don't want that undiscerning audience. Most scientists are impressed by good ideas and interesting findings, so don't hide your ideas behind a wall of junk English."

**Paul J. Siliva, PhD** – psychologist, author of *How to Write a Lot*

**<u>Golden rule:</u> The need for clarity always outweighs the need for brevity!**

Clarity issues can occur at the level of the <u>paragraph</u>, <u>sentence</u>, or individual <u>words</u>.

# Today's Objectives

- Identify common clarity issues occurring at "micro" levels of a scientific manuscript:

  - **Paragraphs**
  - **Sentences**
  - **Words**

- Implement strategies to prevent and treat impediments to clarity

Sources: Day R and Gastel B. *How to Write and Publish a Scientific Paper* 7th ed. Santa Barbara: Greenwood, 2011; Hofmann AH. *Scientific Writing and Communication: Papers, Proposals, and Presentations*. 2nd ed. Oxford: Oxford UP, 2014; Schimel J. *Writing Science: How to Write Papers that Get Cited and Proposals that Get Funded* Oxford: Oxford UP, 2011.

# Clarity Issues @ Paragraph Level

## Problems:

1. Too many points covered in single paragraph

2. Main point of a paragraph is difficult to discern (can't see the forest for the trees)

## Solutions:

- Stick to one major point per paragraph

- Signal your main point by using a clear paragraph structure

# Point-First Paragraphs

- Also called "topic-sentence development (TS-D) model"

- Present main point in first sentence.

- Then provide explanatory details.

- Allows reader to "skim read" effectively

# Point-First Paragraphs

**Example (Results section):**

The 2 weight loss diets differed …in their effect on postprandial glycemia and insulinemia.

Incremental area under the curves for glucose (mean [SE], 2706 [394] vs 1070 [336] mg/dL per minute, $P$=.003) and insulin (5581 [859] vs 2044 [733] µIU/mL per minute, $P$=.003) were more than 2-fold greater for test meals from the low-fat vs low-glycemic load diet groups, respectively.

# Point-Last Paragraphs

- Open with a question or an argument

- Present evidence, develop the argument

- Wrap up with a conclusion.

- Strong at both opening and resolution.

- Helpful when you need to assemble an argument, pulling threads together to weave them into a single conclusion.

# Point-Last Paragraphs

**Example (Results):**

We then questioned whether the phosphorylation of STAT1 at its tyrosine residue 701 is necessary for its downregulation.

Thus, we co-transfected…

As shown in Figure 3D…

There was only a relatively small increase in…, suggesting….

**MORE**

Taken together, our data suggested that NPM-ALK phosphorylates STAT1 at predominantly the Y701 residue, and by doing so, promotes its degradation.

**<u>Problem 3</u>:** Poor logic flow within the paragraph; lack of cohesion among sentences

**<u>Solutions</u>:**

- Apply the "known-new" contract when crafting sentences within the same paragraph

- Use appropriate transition words or phrases

*Cohesion*: the act or state of uniting or sticking together.

# Apply the "Known-New Contract"

**Topic position (beginning of sentence)**
Contains info that links back to what reader already knows

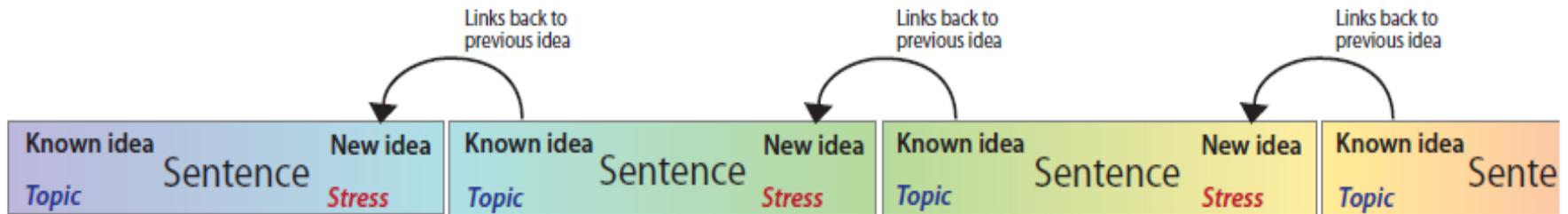**Stress position (end of sentence)**
Contains new info that writer wants to emphasize

1. Exercise is the best strategy for preventing falls in <u>healthy adults aged 60 to 82 years</u>.

vs

2. For healthy adults aged 60 to 82 years, the best strategy for preventing falls is <u>exercise</u>.

# Apply the "Known-New Contract"



Notice how the following example uses the known-new contract to create a coherent flow of ideas.

—Topic—
Accounts of depression evolved after psychologists introduced —Stress— the concepts of
—Stress— Links back —Topic—
defeat and entrapment. These concepts have been implicated in —Stress— theoretical
—Stress— Links back —Topic—
accounts of anxiety and suicide. Such theories. . .

# Example – original sentences

[Topic] People are injuring themselves at home, work and out in public from [Stress] slipping and falling.

topic position does not link back →

[Topic] The material of the shoe sole, the material of the floor surface that the individual is walking across, and a contaminant, like water or oil, that may decrease friction between the two materials [Stress] all contribute to slipping.

# Example – revised sentences

[Topic] People are injuring themselves at home, work and out in public from [Stress] slipping and falling.

[Topic] Factors contributing to slipping include [Stress] the material of the shoe sole, the material of the [Stress] floor surface that the individual is walking across, and a contaminant, like water or oil.

# Use appropriate transition words/phrases

| USE | EXAMPLE | | |
|---|---|---|---|
| | **TRANSITION WORDS** | **TRANSITION PHRASE** | **TRANSITION SENTENCE** |
| Addition | again, also, further, furthermore, in addition, moreover | In addition to X, we … Besides X, … | Further experiments showed that … |
| Concession | clearly, evidently, obviously, undeniably | | Granted that X is … |
| Comparison | also, likewise, similarly, etc. | As seen in … In the same way, | When A is compared with B … As reported by … When compared to … |
| Contrast | but, however, nevertheless, nonetheless, still, yet | In contrast to A … On one hand; on the other hand … Despite X … Unlike X … On the contrary, … | On difference is that … Although X differed … |

| USE | EXAMPLE | | |
|---|---|---|---|
| | **TRANSITION WORDS** | **TRANSITION PHRASE** | **TRANSITION SENTENCE** |
| Example | for example, specifically | To illustrate X … | An example of X is that …, <br> That is, … |
| Explanation | here, therefore, in short | Because of X … <br> In this experiment … | One reason is that … <br> Because X is … |
| Purpose | for this purpose | For the purpose of … <br> To this end, … <br> To determine XYZ, we … | The purpose of X was to … |
| Result | consequently, generally, hence, therefore, thus | As a result of … | Evidence for XYZ was that … <br> Analysis of ABC showed that … |
| Sequence/Time | after, finally, first, later, last, meanwhile, next, <br><br> now, second, then, while, subsequently | After careful analysis of X … <br><br> During centrifugation, … | After X was completed, … <br><br> When we determined X … |
| Summary | in brief, in conclusion, in fact, in short, in summary | To summarize (our results) … | As a summary of our results shows, … |

# Clarity Issues @ Sentence Level

**Problem 1: Subject-verb separation**

**Example:**                                    **Separated by 21 words**

Fourteen <u>patients</u> who were treated at the Children's Hospital between August 1997 and July 2001 for malignant tumors that could not be excised <u>composed</u> the sample.

**Better:**

The <u>sample</u> <u>comprised</u> 14 patients who were treated at the Children's Hospital between August 1997 and July 2001 for malignant tumors that could not be excised.

# Problem 2: Sentence Length

> **"There's not much to be said about the period except that most writers don't reach it soon enough."     - William Zinsser**

**Example:**

These results show that ATP and GTP are capable of binding to the same site in the mRNP but higher specificity is shown for ATP than for GTP, while the other nucleotides tested (CTP, UTP, AMP) did not stimulate the initiation of the translation, on the contrary, they produced some inhibition being most pronounced for UTP and CTP, suggesting that these nucleotides compete with ATP and GTP for the same site in the mRNP.

**(Single sentence, 71 words)**

**Better:**

These results show that ATP and GTP are capable of binding to the same site in the mRNP. Higher specificity is shown for ATP than for GTP. The other nucleotides tested (CTP, UTP, AMP) did not stimulate the initiation of the translation. On the contrary, they produced some inhibition being most pronounced for UTP and CTP, suggesting that these nucleotides compete with ATP and GTP for the same site in the mRNP.

**(Three sentences, average 18 words)**

# Problem 2: Sentence Length

If you write a long sentence, make the key point in a short initial clause.

**EXAMPLE:**

We focused on two members of this family: Rab5, which controls transport from the plasma membrane to the early endosome and regulates the dynamics of early endosome fusion, and Rab7, which governs membrane flux into and out of late endosomes.

[40 words]

# Problem 2: Sentence Length

Replace common phrases with their simpler equivalents

| Empty Phrase (jargon) | Preferred Equivalent |
|---|---|
| at this point in time | now |
| a number of | many |
| due to the fact that | because |
| during the time that | while |
| in close proximity to | near |
| give rise to | cause |
| if conditions are such that | if |
| are of the same opinion | agree |
| ascertain the location of | find |
| the vast majority of | most |
| a greater number of | more |

# Problem 3: Lack of Parallel Structure

**Example:**

Prolonged febrile illness, together with subcutaneous nodules in a child, could be due to an infection with a Gram+ organism, but it could also be that the child suffers from rheumatic disease.

**Better:**

Prolonged febrile illness, together with subcutaneous nodules in a child, could be due to *an infection with a Gram+ organism* or due to *rheumatic disease*.

# Problem 3: Lack of Parallel Structure

To write ideas in parallel form, use the same grammatical structures.

|  | Direct Object | Preposition | Object of Preposition |
|---|---|---|---|
| Based on our hypothesis, we expected to see: | a decrease | in | the infection rate |
| | an increase | in | the survival rate of patients. |

# Problem 4: Faulty comparisons

Sentence is comparing things that cannot logically be compared, or the comparison is ambiguous as written.

**Example 1**

She enjoyed Hayden's symphonies more than Mozart.

**Revision**

She enjoyed Hayden's symphonies more than those of Mozart.

**Example 2**

The side effects associated with taking Drug A were similar to Drug B.

**Revision**

The side effects associated with taking Drug A were similar to those associated with taking Drug B.

# Problem 4: Faulty comparisons

The adjectival phrase ***compared with*** is often "misplaced" in the sentence – it is not placed next to the noun that it actually is meant to describe.

**Example:**

**Incorrectly suggests that you are comparing "drug" (the closest noun) with "women"**

Men are more likely to benefit from this <u>drug</u> compared with <u>women</u>.

**Revision, with modifier correctly placed:**

<u>Compared with women</u>, <u>men</u> are more likely to benefit from this drug.

# What about this example?

Blood pressure decreased 20% in Group A compared with Group B.

1. What happened to bp in Group B?

2. How is what happened in Group A different from (or similar to) what happened to Group B?

# Could be interpreted in several ways

Blood pressure decreased 20% in Group A compared with Group B.

| What really happened? | How can text be clarified? |
|---|---|
| **BP decreased only in Group A, not in Group B.** | From time 1 to time 2, blood pressure decreased 20% in Group A but remained stable in Group B. |
| **BP decreased in both groups, but decline was more pronounced in Group A than in Group B.** | The decline in blood pressure from time 1 to time 2 was 20% greater in Group A than in Group B. |

# Take-Home Message

Poorly written comparisons are so prevalent in the scientific literature that most of us, having "learned by reading," are tempted to repeat the errors we see in print.

**Resist the temptation!**

# Clarity Issues @ Word Level

**Problem 1:  Imprecise Words**

**Example:**

Renal blood flow was <u>drastically compromised</u> when the aorta was obstructed.

*("Compromise" = "to place at risk.")*

**Better:**

greatly reduced

reduced by 80%

# Problem 1:  Imprecise Words

**Example:**

The study <u>involved</u> 15 healthy men.

**Better:**

Fifteen healthy men <u>enrolled in</u> the study.

# Problem 2:  Overuse of nominalizations

- Nominalizations = verbs made into nouns    *-tion, -ment, -ence, -al*

- Often done to make statements appear more neutral.

- Make the writing less "active" (lively, interesting, engaging)

- Often requires several words when one word would do.

# **Solution:** Turn nominalizations into verbs.

| **Examples** | **Revision** |
|---|---|
| • We made the determination that community members are effective intervention leaders. | • We determined that community members are effective intervention leaders. |
| • Separation of the compounds was accomplished by liquid chromatography. | • The compounds were separated by liquid chromatography. |
| • The occurrence of these behaviors was noted in three subjects. | • These behaviors occurred in three subjects. |

# Problem 3: Vague Pronoun Antecedents

<u>Antececent</u> = the noun that a pronoun is replacing

**Example 1:**

Monkeys of this species are not susceptible to these diseases, so research on *them* is hampered.

**Example 2:**

Children are born with billions of neurons in *their* brains, but in order for *them* to be connected properly *they* need to be touched and talked to extensively by *their* parents.

**Solution:** Be very clear in referencing pronoun antecedents (inserting original noun as needed) so readers will understand your meaning rapidly (on first read)

# Problem 4: Misuse of relative pronouns *that* and *which* (not interchangeable!)

**Example 1:**

Colonoscopy is one of those screening tests *that/which* patients seem eager to avoid.

**Example 2:**

Colonoscopy, *that/which* is recommended for all patients over age 50, is an underutilized screening test.

*That* is used to introduce <u>restrictive</u> clauses.

<u>Restrictive clauses</u> are necessary for the meaning of the sentence. Their inclusion "limits, defines, or restricts" what is being talked about.

**Example:**
Colonoscopy is one of those screening tests *that patients seem eager to avoid*.

**Punctuation rule:** Restrictive elements in a sentence are NOT set off by commas.

*Which* is used to introduce nonrestrictive clauses.

Nonrestrictive clauses add information that may be interesting and helpful, but not essential for the meaning of the sentence. Their omission does not make the sentence ambiguous.

**Example:**
Colonoscopy, *which is recommended for all patients over age 50*, is an underutilized screening test.

**Punctuation rule:** Non-restrictive elements in a sentence are set off by commas.

Incorrect usage of *which* and *that* can change the entire meaning of a sentence.

**Example: How does the meaning of each sentence differ?**

a) We are studying transcription factors *that have an α-helical activation domain.*

b) We are studying transcription factors, *which have an α-helical activation domain.*

# Problem 5: Word Clusters (pile ups)

Lengthy strings of words used as adjectives for another noun.



## *Examples:*

- the negative penicillin skin test result group
- bilateral anterior magnetic phrenic nerve stimulation
- two-dimensional real time ultrasonographic blood flow detection techniques

**Solution:** Disentangle the clusters by inserting one or more prepositions. This helps to clarify the relationship between words.

| Problematic | Revision |
|---|---|
| • cultured sheep pulmonary artery endothelial cells | • cultures *of* endothelial cells *from* the pulmonary artery *of* sheep |
| • artificial intelligence information retrieval approaches | • Approaches that use artificial intelligence *to* retrieve information [?] |
| | • Approaches *for* retrieving information about artificial intelligence [?] |

*This original text could be misinterpreted! Would need to query author to determine which revision is actually the intended meaning.*

# Problem 6: Subject and verb disagree in number (singular/plural)

- The patients *is/are* required to sign a consent form.

- A review of all patients with grade 3 tumors *was/were* undertaken.

- Consumption of sugar in large amounts *cause/causes* an inflated level of insulin.

- The rate and effect of infection in this population *is/are* not well characterized.

- The most significant factor that affected the study results *was/were* interhospital variations in the severity of illness.

# Final Thought

“A clear sentence is no accident. Very few sentences come out right the first time, or even the third time. Remember this in moments of despair. If you find that writing is hard, it's because it is hard. It's one of the hardest things that people do.”

-- William Zinsser