Writing in the Sciences

Module 4.1: More paragraph practice

Review: experiment with punctuation!

Supersymmetry relates each particle of the standard model to another particle called its superpartner; the symmetry is about spin—a standard-model fermion has a bosonic superpartner, and vice versa. By convention, superpartners of fermions gain a prefix 's' (such as selectron, squark and sneutrino), and those related to bosons gain the suffix 'ino'. The prime candidate for dark matter among all of these superparticles is the so-called neutralino—which is a mixture (technically, a mass eigenstate) formed by the superpartners (zino, photino and higgsino) of standard-model bosons. Other candidates are sneutrinos, and gravitinos, which are related to the graviton (although, strictly speaking, gravitinos belong to extended versions of supersymmetric models, known as supergravity models, in which gravity is included.)

From: Merle A, Ohlsson T. Dark matter: Supersymmetry wimps out? *Nature Physics* 2012 8: 584–586.

In a moment, I will ask you to pause the video to edit this paragraph:

In assessing the quality of an instrument we distinguish three quality domains, i.e. reliability, validity, and responsiveness. Each domain contains one or more measurement properties. The domain reliability contains three measurement properties: internal consistency, reliability, and measurement error. The domain validity also contains three measurement properties: content validity, construct validity, and criterion validity. The domain responsiveness contains only one measurement property, which is also called responsiveness. The term and definition of the domain and measurement property responsiveness are actually the same, but they are distinguished in the taxonomy for reasons of clarity. Some measurement properties contain one or more aspects, that were defined separately: Content validity includes face validity, and construct validity include structural validity, hypotheses testing, and cross-cultural validity.

What's the paragraph about?

Domain	**Measurement Property**	**Aspect**
Reliability	consistency	
	reliability	
	measurement error	
Validity	criterion validity	
	content validity	face validity
	construct validity	structural validity
		hypothesis testing
		cross-cultural validity
Responsiveness	responsiveness	

Possible revision

We assess each instrument based on reliability, validity, and responsiveness. These domains may be subdivided into measurement properties: Reliability includes internal consistency, reliability, and measurement error; validity includes content validity, construct validity, and criterion validity; responsiveness is both a domain and a measurement property. Some measurement properties additionally contain multiple aspects; for example, construct validity includes structural validity, hypothesis testing, and cross-cultural validity.

Editing practice: paragraph 1 of 2...

The church's record-keeping system and its high level of accuracy has been previously reported (2). Briefly, the church creates and maintains a church record for each individual who is baptized into the church. These records are created at the congregation level at the time of baptism and then forwarded to the general church level where the membership record is added to the church membership database. These records contain minimal information including name, date of birth, parents' names, dates of church ordinances, and current address. Each congregation has a lay membership clerk who is responsible for updating the membership records for the members of the congregation. Such updates would include dates of ordinances received after baptism (e.g., priesthood ordination or marriage), name of spouse when a member marries, change of current address and date of death.

Editing practice: paragraph 2 2...

While the accuracy of the church record is dependent upon lay clerks within each congregation, each member has an opportunity to review their membership record once a year to check it for accuracy. For this reason and because the church emphasizes accurate record keeping, the information available from the church records is quite reliable, especially for members who are actively involved in the church. When a member dies and the clerk reports his/her death to the Church Membership Council, the membership record is updated and then archived in the church's deceased membership file.

Now I will ask you to pause the video to edit both paragraphs...

The church's record-keeping system and its high level of accuracy has been previously reported (2). Briefly, the church creates and maintains a church record for each individual who is baptized into the church. These records are created at the congregation level at the time of baptism and then forwarded to the general church level where the membership record is added to the church membership database. These records contain minimal information including name, date of birth, parents' names, dates of church ordinances, and current address. Each congregation has a lay membership clerk who is responsible for updating the membership records for the members of the congregation. Such updates would include dates of ordinances received after baptism (e.g., priesthood ordination or marriage), name of spouse when a member marries, change of current address and date of death.

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Edited version (1 paragraph)

The church's record-keeping system is accurate and reliable (2). When a new member is baptized, the church congregation creates a member record that includes: name, date of birth, parents' names, current address, and dates of church ordinances. A lay clerk enters these records into a general church database and updates them to reflect dates of new ordinances (e.g. marriage), spouse name, changes of address, and date of death. Members may review their membership records once a year, which helps ensure accuracy. When a member dies, the membership record is archived.

Edited version (1 paragraph)

The church's record-keeping system is accurate and reliable (2). When a new member is baptized, the church congregation creates a member record that includes: name, date of birth, parents' names, current address, and dates of church ordinances. A lay clerk enters these records into a general church database and updates them to reflect dates of new ordinances (e.g. marriage), spouse name, changes of address, and date of death. Members may review their membership records once a year, which helps ensure accuracy. When a member dies, the membership record is archived.

In a moment, I will ask you to pause the video to edit this paragraph:

Previous studies have consistently reported increased risk of subsequent drug use associated with conduct problems and antisocial behavior in childhood (1-5), and an association of drug dependence with conduct problems was found in a general survey of young adults (9). Furthermore, long-term relationships between aggressive, unconventional, and impulsive behaviors have also been found with drug use involvement generally (10-12). However, different pathways between early childhood misbehavior and drug involvement may exist. Psychiatric symptoms and cognitive disabilities may be manifest as aggressive behaviors and drug use may be a response to impulsive tendencies that often co-occur with aggression or misbehavior. Distress and failure to adopt responsible conventional roles and behaviors may be important mediators linking childhood misbehavior to late drug dependence (13,14).

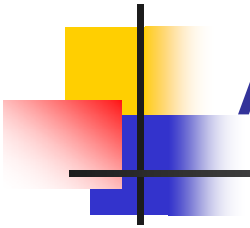
Possible rewrite (separate ideas into two paragraphs)

Previous studies have linked early childhood conduct problems with subsequent drug use (1-5). Studies have also found that young adult (9) and adult (10-12) drug users exhibit more aggressive, unconventional, and impulsive behaviors than their peers.

Several pathways may explain our finding: aggressive children may have underlying psychiatric disorders or cognitive disabilities that increase their risk of drug use; misbehavior tends to co-occur with impulsivity, which increases the risk of drug use; and childhood misbehavior may lead to long-term problems, such as persistent distress or a failure to ever adopt conventional roles or behaviors, which may lead to drug dependence (13,14).

Possible rewrite (remove unrelated material)

Previous studies have linked early childhood conduct problems—including aggressive, antisocial, and unconventional behaviors—with subsequent drug use (1-5). Several pathways may explain this link: aggressive children may have underlying psychiatric disorders or cognitive disabilities that increase their risk of drug use; misbehavior tends to co-occur with impulsivity, which increases the risk of drug use; and childhood misbehavior may lead to long-term problems, such as persistent distress or a failure to ever adopt conventional roles or behaviors, which may lead to drug dependence (13,14).



Acknowledgements

- Thanks to Gary Friedman of Stanford University for providing examples for this course.

Writing in the Sciences

Module 4.2: Overview of the Writing Process

Steps in the writing process:

1. Prewriting

- Collect, synthesize, and organize information
- Brainstorm take-home messages
- Work out ideas away from the computer
- Develop a road map/outline

2. Writing the first draft

- Putting your facts and ideas together in organized prose

3. Revision

- Read your work out loud
- Get rid of clutter
- Do a verb check
- Get feedback from others

What does your writing process look like now?

Proportionally, how much time do you think you spend on each step?

1. Prewriting
2. Writing
3. Revision

What I think it should be (roughly!):

1. Prewriting (70%)
2. Writing the first draft (10%)
3. Revision (20%)

Writing in the Sciences

Module 4.3: The Pre-writing Step

1. Prewriting tips

Get organized first!

- Don’t try to write and gather information simultaneously!
- Gather and organize information BEFORE writing the first draft.

Organizing your thoughts...

Do you have an organizational system?

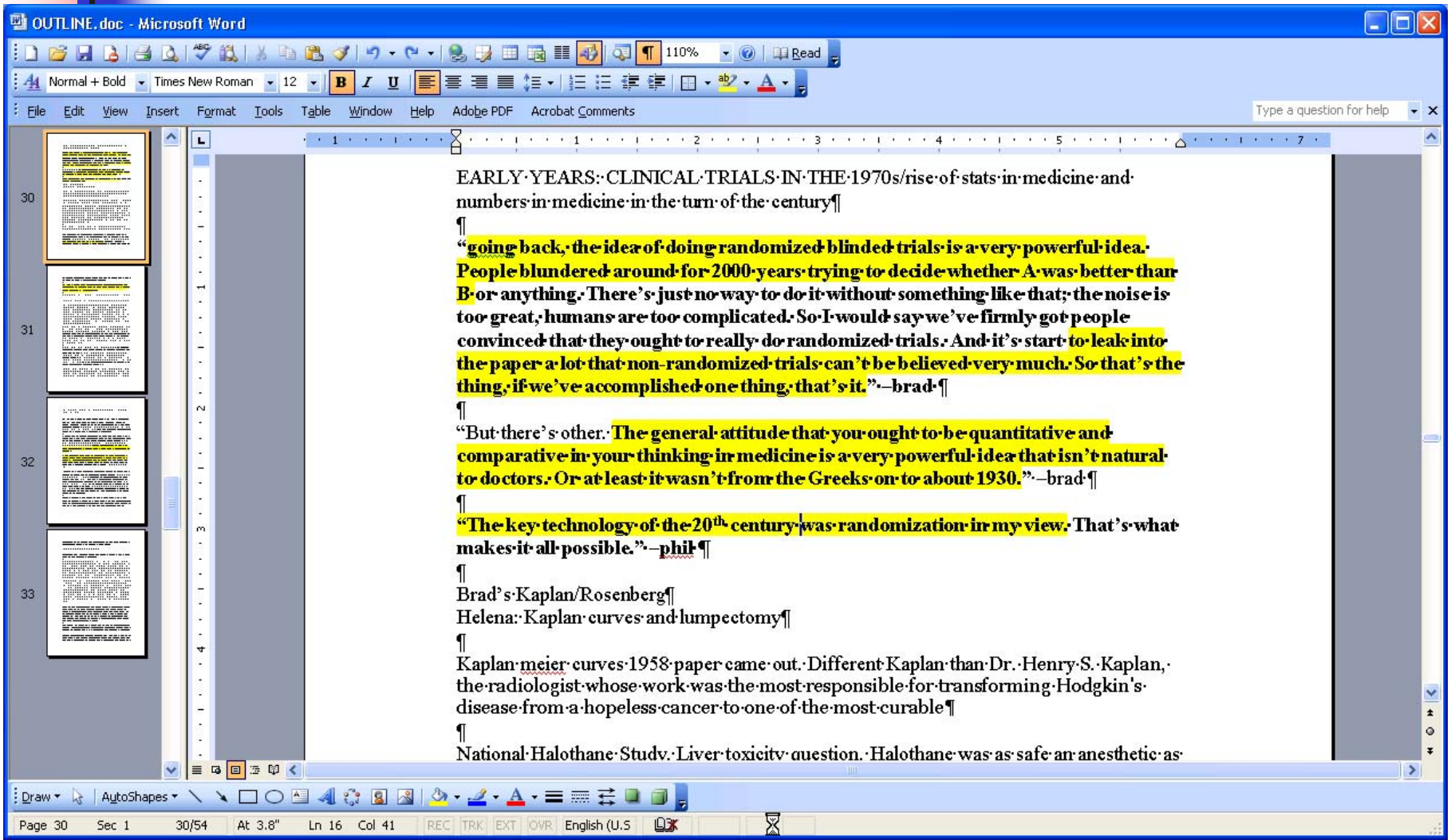
If you don’t, create one that suits you!

Spend more time organizing and less time writing. It’s just plain less painful!

Develop a road-map

- Arrange key facts and citations from the literature into a crude road map/outline BEFORE writing the first draft.
- Think in paragraphs and sections...

Example “road-map”



Brainstorm away from the computer

- Write on the go!
  - While exercising (Turn off that ipod!)
  - While driving alone (Turn off the radio!)
  - While waiting in line (Put down the magazine!)
- Work out take-home messages
- Organize your paper
- Write memorable lines

Compositional organization:

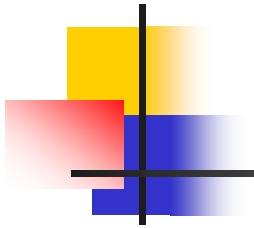
1. Like ideas should be grouped.
2. Like paragraphs should be grouped.
3. Don’t “Bait-and-Switch” your reader too many times.

    When discussing a controversy, follow:

        arguments (all)

        counter-arguments (all)

        rebuttals (all)



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Module 4.4: The Writing Step

Tips for writing the first draft:

- Don’t be a perfectionist!
- The goal of the first draft is to get the ideas down in complete sentences in order.
- Focus on logical organization more than sentence-level details.

- Writing the first draft is the hardest step for most people. Minimize the pain by writing the first draft quickly and efficiently!

Example of first-draft writing:

Errors in publication occur when the authors have typos, omissions, or such poor writing of the methods that others cannot figure out what they did or reproduce their tables and figures. Sometimes there's just so much to write up that errors will occur in almost every case.

Revised version:

Published papers frequently have typos, omissions, and otherwise poor documentation of methods. These errors make it impossible to figure out exactly what was done or to reproduce the results.

Example of first-draft writing:

The finding of these HLA alleles may have some practical implications as well. Now we all divide up into those who carry archaic DNA and those who don't. A potential implication is that people who carry archaic HLAs could be more prone to autoimmunity. Autoimmunity is associated with HLA factors. There could be downsides to archaic HLAs. Since we've evolved separately from Neanterdals for a few hundred thousand years, we may have evolved important differences in the proteins that interact with HLA. The archaic HLAs may interact more poorly with some of these proteins, potentially causing mistakes, like autoimmunity. "This is all just speculation. But we have been apart for all this time, so it would be very surprising if there weren't differences," Parham says. "It would solve a long-standing puzzle."

Revised version:

Neanderthal (or Denisovan) proteins continue to live on and function inside us; and this may also have a downside, Parham notes. Neanderthals evolved separately from us for a few hundred thousands years, so their proteins may be somewhat mismatched to our immune systems and could play a role in autoimmune disease. Autoimmunity is poorly understood but known to be related to HLA types. “This is all just speculation. But we have been apart for all this time, so it would be very surprising if there weren’t differences,” Parham says. “It would solve a long-standing puzzle.”

Example of first-draft writing:

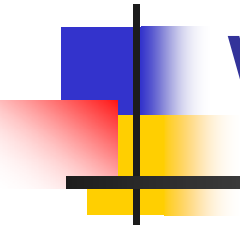
It's also difficult to study the biology because the brain is so inaccessible. Cancer scientists can take out a tumor and look directly at the cells, but autism researchers cannot directly study brain cells (except on autopsy), let alone developing brain cells. Stanford is on the cutting edge of solving this problem—in fact, Dolmetsch's solution is so innovative it seems straight out of a science fiction novel.

Revised version:

It’s also difficult to access the brain. Scientists can slice cancer cells out of a tumor and directly study them, but they can’t just scoop cells out of the brain, let alone the developing brain. Stanford is on the cutting edge of solving this problem—in fact, Dolmetsch’s solution seems straight out of a science fiction novel.

Final version (after outside editing!):

Another impediment: access to the brain. Scientists can slice cancer cells out of a tumor and study them directly, but they can't just scoop cells out of the brain. Stanford is on the forefront of solving this problem—in fact, Dolmetsch's solution seems straight out of a science fiction novel.



Writing in the Sciences

Module 4.5: Revision

Tips on revision

- Read your work out loud
- Do a verb check
- Cut clutter
- Do an organizational review
- Get feedback from others
- Get editing help

Read your writing out loud

The brain processes the spoken word differently than the written word!

Do a verb check

Underline the main verb in each sentence. Watch for:

(1) lackluster verbs (e.g., There <u>are</u> many students who struggle with chemistry.)

(2) passive verbs (e.g., The reaction <u>was observed</u> by her.)

(3) buried verbs (e.g., A careful monitoring of achievement levels before and after the introduction of computers in the teaching of our course <u>revealed</u> no appreciable change in students' performances.).

Don’t be afraid to cut!

Watch for:

- Dead weight words and phrases (it should be emphasized that)
- Empty words and phrases (basic tenets of, important)
- Long words or phrases that could be short (muscular and cardiorespiratory performance)

Don’t be afraid to cut!

Watch for:

- Unnecessary jargon and acronyms
- Repetitive words or phrases (teaches clinicians/guides clinicians)
- Adverbs (very, really, quite, basically)

Do an organizational review

In the margins of your paper, tag each paragraph with a phrase or sentence that sums up the main point.

Then move paragraphs around to improve logical flow and bring similar ideas together.

Get outside feedback

Ask someone outside your department to read your manuscript.

Without any technical background, they should easily grasp:

-the main findings

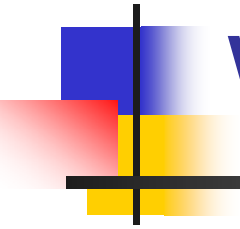
-take-home messages

-significance of your work

Ask them to point out particularly hard-to-read sentences and paragraphs!

Get editing help

Find a good editor to edit your work!



Writing in the Sciences

Module 4.6: Checklist for the final draft

Checklist for final draft:

- Check for consistency
- Check for numerical consistency
- Check your references

Check for consistency

"We followed participants for a minimum of 2 years" (methods section)

"The average follow-up time was 1.5 years" (results section)

Check for numerical consistency

- Do the numbers in your abstract match the numbers in your tables/figures/text?
- Do the numbers in the text match those in the tables/figures?
- Do the numbers in each table/figure match those in other tables/figures?

Check your references

- Do you have “references to nowhere”?
- Reference does not provide the indicated information/fact.
  - Authors misinterpreted or exaggerated the findings from the original source.
  - Reference cites a secondary source rather than a primary source. (Citation propagation!)
  - Authors mis-numbered the references.

Check your references

- Example:

"These data are particularly disturbing as the UVC emission is even larger than ambient sunlight on a mountain (13,14)."

  - Reference 13=broken URL link; searching on the site turns up no relevant information
  - Reference 14=contains no mention of ambient sunlight, mountains, or UVC light

Citation Propagation!

- In many papers and reviews of eating disorders in women athletes, authors cite the statistic that “15 to 62% of female athletes have disordered eating.”
- I’ve found this statistic attributed to about 50 different sources in the literature...

For example...

- "It has been estimated that the prevalence of disordered eating in female athletes ranges from 15% to 62%." (from: *Journal of General Internal Medicine*)
  Citations given:

  Steen SN. The competitive athlete. In: Rickert VI, ed. *Adolescent Nutrition: Assessment and Management*. New York, NY: Chapman and Hall; 1996:223 47.

  Tofler IR, Stryer BK, Micheli LJ. Physical and emotional problems of elite female gymnasts. *N Engl J Med*. 1996;**335**:281 3.

And…

- Fact Sheet on eating disorders:
- **“Among female athletes, the prevalence of eating disorders is reported to be between 15% and 62%.”**
  Citation given: Costin, Carolyn. (1999) The Eating Disorder Source Book: A comprehensive guide to the causes, treatment, and prevention of eating disorders. 2nd edition. Lowell House: Los Angeles.

And…

- In a 2000 review (Hobart and Smucker, The Female Athlete Triad, *American Family Physician,* 2000):
- "Although the exact prevalence of the female athlete triad is unknown, studies have reported disordered eating behavior in 15 to 62 percent of female college athletes."
- No citations given.

And...

- "Studies report between 15% and 62% of college women engage in problematic weight control behaviors (Berry & Howe, 2000)." (in *The Sport Journal*, 2004)
- Citation: Berry, T.R. & Howe, B.L. (2000, Sept). Risk factors for disordered eating in female university athletes. *Journal of Sport Behavior*, 23(3), 207-219.

And…

- 1999 NY Times article
- “But informal surveys suggest that 15 percent to 62 percent of female athletes are affected by disordered behavior that ranges from a preoccupation with losing weight to anorexia or bulimia.”

Where did the statistics come from?

The 15%: Dummer GM, Rosen LW, Heusner WW, Roberts PJ, and Counsilman JE. Pathogenic weight-control behaviors of young competitive swimmers. *Physician Sportsmed* **1987**; 15: 75-84.

The "to": Rosen LW, McKeag DB, O'Hough D, Curley VC. Pathogenic weight-control behaviors in female athletes. *Physician Sportsmed*. **1986**; 14: 79-86.

The 62%:Rosen LW, Hough DO. Pathogenic weight-control behaviors of female college gymnasts. *Physician Sportsmed* **1988**; 16:140-146.

Where did the statistics come from?

- Study design? Control group?
  - Cross-sectional survey (all)
  - No non-athlete control groups
- Population/sample size?
  - Convenience samples
  - Rosen et al. 1986: 182 varsity athletes from two midwestern universities (basketball, field hockey, golf, running, swimming, gymnastics, volleyball, etc.)
  - Dummer et al. 1987: 486 9-18 year old swimmers at a swim camp
  - Rosen et al. 1988: 42 college gymnasts from 5 teams at an athletic conference

Where did the statistics come from?

- Measurement?
  - Instrument: Michigan State University Weight Control Survey
  - Disordered eating = at least one pathogenic weight control behavior:
    - Self-induced vomiting
    - fasting
    - Laxatives
    - Diet pills
    - Diuretics
    - In the 1986 survey, they required use 1/month; in the 1988 survey, they required use twice-weekly
    - In the 1988 survey, they added fluid restriction

Where did the statistics come from?

- Findings?
  - Rosen et al. 1986: 32% used at least one “pathogenic weight-control behavior” (ranges: 8% of 13 basketball players to 73.7% of 19 gymnasts)
  - Dummer et al. 1987: 15.4% of swimmers used at least one of these behaviors
  - Rosen et al. 1988: 62% of 42 gymnasts used at least one of these behaviors

Take-home message:

- Always cite/go back to primary sources!
- Assume that other authors have made errors in citing sources!