imRad - Result

Verifies your findings

Confirms your contributions

Decide - what results you want to present ?

- what the order in which you want to present them is?

Get conclusive or novel findings foregrounded

Use visuals -tables, figures, diagrams, charts, or drawings

Comment your data – mistakes usually happen

Results ≠ Raw Data

- The results section should:
  - Summarize what the data
    - Point out simple relationships
    - Describe big-picture trends
    - Refer to figures or tables that present supporting data
  - Avoid simply repeating the numbers that are already available in tables and figures.

Examples

"Over the course of treatment, topiramate was significantly more effective than placebo at improving drinking outcomes on drinks per day, drinks per drinking day, percentage of heavy drinking days, percentage of days abstinent, and log plasma -glutamyl transferase ratio (Table 3)."

"The total suicide rate for Australian men and women did not change between 1991 and 2001 because marked decreases in older men and women (Table 1) were offset by increases in younger adults, especially younger men.[2]"

Tips for writing Results

- **Break into subsections, with headings (if needed)**
- **Complement the information that is already in tables and figures**
  - **Give precise values that are not available in the figure**
  - **descbribe difference if absolute values are given in the table**
    - 'A exercised 60 minutes a day' and 'B exercised d 30 minutes a day'
    - A exercised as long as B per day
- **Repeat/highlight only the most important numbers**

What verb tense do I use?

*Use past tense for completed actions:

We found that…
The average reaction time was…
Women were more likely to…

*Use the present tense for assertions that continue to be true, such as what the tables show, what you believe, and what the data suggest:

Figure 1 shows…
The findings confirm… The data suggest…
We believe that this shows…

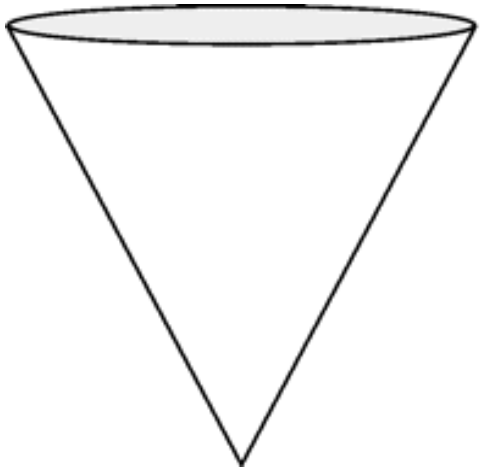
Example: verb tense

Example:

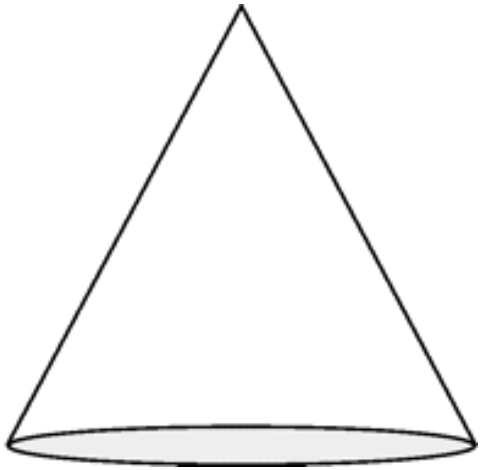
Information was available for 7766 current cigarette smokers. Of these, 1216 (16%) were classified as hardcore smokers. Table 1 gives characteristics of all the smokers. The most striking difference was that hardcore smokers were about 10 years older on average and tended to be more dependent on tobacco. Significantly more hardcore smokers had manual occupations, lived in rented accommodation, and had completed their full time education by the age of 16 years. There was no difference by sex.

imraD – Discussion

- Discuss and interpret your findings
- Connect to previous research



Shape of the introduction :
Starting with a broad context and narrowing down to your specific purpose



Shape of the discussion :
Restating your main findings and broadening out to discuss the result at large

Structuring the Discussion

Key finding (answer to the question(s) asked in Intro.)	• Start with: "WE FOUND THAT…" (or something similar) • Explain what the data mean (big-picture!) • State if the findings are novel
Key secondary findings	
Context	• Give possible mechanisms or methods • Compare your results with other people's results • Discuss how your findings support or challenge the paradigm
Strengths and limitations	• Anticipate readers' questions/criticisms • Explain why your results are robust
What's next	• Point out unanswered questions and future directions
The "so what?": A broader implication	• Give the big-picture (human) implications of basic science findings • Tell readers why they should care
Strong conclusion	• Restate your main finding. • Give final take-home messages.

The Discussion: verb tense

Past, when referring to study details, results, analyses, and background research:

- We found that
- Subjects may have experienced
- Miller et al. found

Present, when talking about what the data suggest:

The greater weight loss suggests

The explanation for this difference is not clear.

Potential explanations include

Abstract

Abstracts (ab=out, trahere=pull; "to pull out")

- Overview of the main story, written at last
- Gives highlights from each section of the paper
- Limited length (100-300 words, typically)
- Most often, the only part people read

Writing the abstract after writing the paper!

Abstract

1. Background
   ”what topic is concerned”, motivate the importance
2. Question/aim/hypothesis
   “We aim to design/explore that …,” etc.
3. Method(s)
   Quick summary of key materials and methods
4. Results
   Key results found, important features
5. Conclusion: The answer to the question asked/take-home message
6. Implication, speculation, or recommendation

What’s the implication? how does the research related to the real world?

Example Abstract

- **Background**: Parallel operation of multiple grid-connected power converters through LCL filters is known to have the potential problem of triggering oscillations in the ac mains. Such oscillatory frequencies are not integral multiples of the fundamental frequency and, hence, form a new source of inter-harmonics. Early detection of such oscillations is essential for the parallel power converters to move out of the unstable zone.
- **Aim:** This paper presents an online observer-based algorithm that can perform fast detection of inter-harmonics within a specified frequency band.
- **Method:** The algorithm has been adopted in a specific and reduced form from an integral observer algorithm for detection of fundamental and interharmonic voltage components in the ac mains. A new method based on the kernel signal for fast interharmonic detection is proposed and practically verified.
- **Results:** It has been implemented in a digital controller to detect oscillations such as those occurring between two grid-connected power converters. The practical results indicate that the algorithm can locate such frequency within the specific frequency band within one mains cycle.

Structure within sections/subsections

Recommended Organization

Header: Begin your memo with the four standard memo heads (Date, To, From, Subject).

Body/Discussion: In the first paragraph of the body, start off with the good news. Memos do not begin with greetings or salutations. Explain what factors could have contributed to this new development (i.e. increased sales, raising stock price, etc.) and why the decision was made to reward employees with the surplus funds.

The second paragraph is where you explain the new process that the employees can expect. Outline the way that reviews will be handled, and by whom. Feel free to be creative (yet somewhat realistic) when outlining how the performance scores will translate into bonuses (i.e. tier system, seniority, contribution value).

In the third paragraph, be sure to validate any anticipated concerns employees may have about this adjustment. Explain the greater benefit in the long-term this decision provides and conclude your memo by indicating how the reader may contact you if he/she has any questions. In general, this section should be "short & sweet," making sure that the employees know what is expected of them.

Bacon ipsum dolour sit amet porchetta beef turkey, bacon turducken boudin hamburger venison ball tip. Brisket pork loin bresaola short loin ground round leberkas pastrami tongue jerky cow turducken beef ribs. Pork ribeye landjaeger prosciutto pig venison tenderloin. Swine beef ribs kielbasa, porchetta tenderloin salami venison pork belly tail.

More Bacon ipsum dolour sit amet porchetta beef turkey, bacon turducken boudin hamburger venison ball tip. Brisket pork loin bresaola short loin ground round leberkas pastrami tongue jerky cow turducken beef ribs. Pork ribeye landjaeger prosciutto pig venison tenderloin. Swine beef ribs kielbasa, porchetta tenderloin salami venison pork belly tail.

Ipsum dolour sit amet porchetta beef turkey, bacon turducken boudin hamburger even more *Bacon* venison ball tip. Brisket pork loin bresaola short loin ground round leberkas pastrami tongue jerky cow turducken beef ribs. Pork ribeye landjaeger prosciutto pig venison tenderloin. Swine beef ribs kielbasa, porchetta tenderloin salami venison pork belly tail.

soning begins

- Subheadings – topic sentences or transitional phrases
- Division into paragraphs
  - One idea per paragraph
  - Indicating the start of a new paragraph
    - leave a blank line between paragraphs
    - indent the first line of a new paragraph

A list of linking words for different purposes

Purpose	**Transitional phrases (linking words)**
addition	*and, also, moreover, in addition, furthermore, besides*
contrast	*but, however, in contrast, on the one hand - on the other hand,* *the former - the latter, actually, nevertheless, while*
similarity	*such, similarly, the same, equally*
exemplification	*for example, for instance, in other words*
chronology	*first, second, then, afterwards, thereafter, meanwhile, at the* *same time, next, later, finally, at last, ultimately*
causality	*so, consequently, therefore, thus, accordingly, although, because of, hence, as a result, since*
attitude	*of course, naturally, obviously, fortunately, unfortunately, certainly, admittedly*
summary	*to summarise, to sum up, in conclusion, in brief*

Structure within paragraph

house -- text
wall -- section
building blocks -- paragraphs

- The basic internal architecture remains the same
  - a topic sentence, supporting sentences, and a concluding sentence
- One paragraph -- 1 point
- Between paragraphs – show shift of ideas

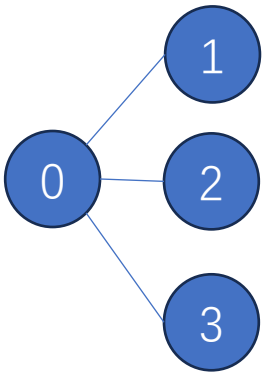
Paragraph: Topic sentence

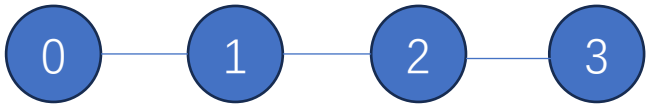
- Containing the main idea
- Often the first sentence
- Micro-structure of a topic sentence
  - State what the paragraph is about
  - say something about the manner in which this topic will be approached – controlling idea
  - Breaks between paragraphs

E.g.
"Begging provides offspring with benefits in the form of 'free food' (reviewed in Wright & Leonard 2002)."

Paragraph: Supporting sentences

- Various forms
  - examples or illustrations, explanations, definitions, comparisons or contrast, or some form of causal analysis.
- Connecting to the topic sentence
  - relate directly back to the topic sentence
  - related back to the previous sentence
  - a combination of the two methods





Paragraph: Supporting sentences

logical flow of ideas:

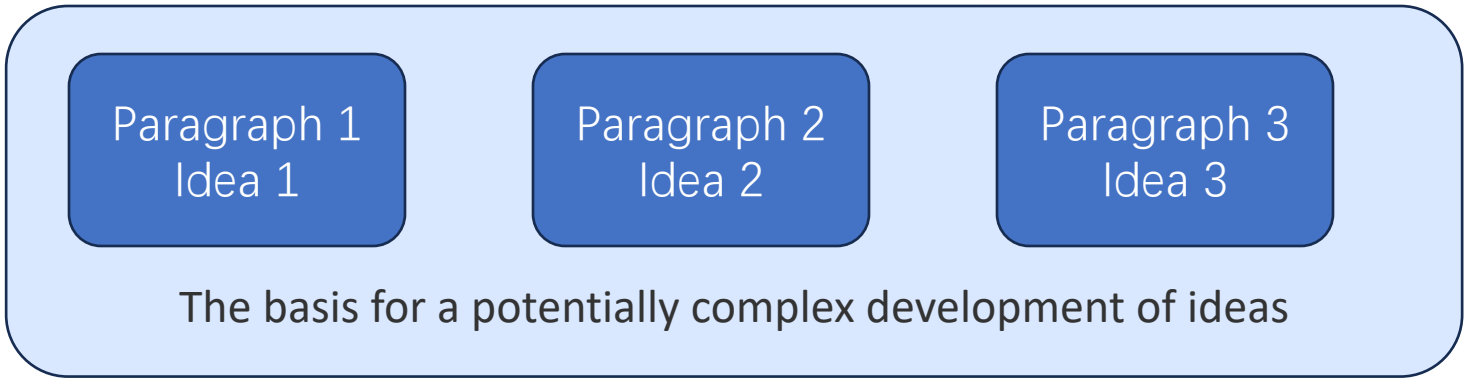
- Sequential in time (avoid the Memento approach!)
- General→ specific (take-home message first!)
- Logical arguments (if a then b; a; therefore b)

Paragraph: Supporting sentences

"Such benefits to offspring occur at a cost to the adults that provide the food (Pugesek 1990; Wheelwright et al. 2003). This produces a conflict of interest between the offspring and the adults (Trivers 1974), such that offspring are expected to benefit from extending their begging period and attendant food supply, while adults benefit from stopping providing food to begging offspring. Eventually, all offspring cease demanding 'free food' and stop begging."

Paragraph: concluding sentence

- Transition in to the next paragraph
- Consider its relation to the whole



"Why do individuals stop begging, and so lose a low-cost source of nutrition? Three mechanistic explanations have been suggested, and these could apply to either vocal or non-vocal begging displays."

Tables and Figures

Tables and Figures are the foundation of your story!

Editors, reviewers, and readers may look first (and maybe only) at titles, abstracts, and tables and figures!

Figures and tables should stand alone and tell a complete story. The reader should not need to refer back to the main text.

- Define the acronyms
- Give the experiment details

Tables vs. Figures

- Figures
  - Visual impact
  - Show trends and patterns
  - Tell a quick story
  - Tell the whole story
  - Highlight a particular result
- Tables
  - Give precise values
  - Display many values/variables

Table Title

- Identify the specific topic or point of the table.
- Use the same key terms in the table title, the column headings, and the text of the paper
- Keep it brief!
- Example: “Descriptive characteristics of the two treatment groups, means ± SD or N (%)”

Table Formats

Model your tables from already published tables!

- **Follow journal guidelines RE:**
  - Roman or Arabic numbers
  - centered or flush left table number, title, column, headings, and data
  - capital letters and italics
- **Most journals use three horizontal lines: one above the column headings, one below the column headings, and one below the data**

Example table:

Three horizontal lines

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
Age (yrs)	45 ± 5	36 ± 6*
Female	11 (85%)	10 (83%)
BMI (kg/m^2)	21 ± 6	23 ± 3
Systolic BP (mmHg)	140 ± 10	120 ± 9*
Exercise (min/day)	30 ± 20	60 ± 30*
Employment status		
Unemployed	4 (31%)	0 (0%)
Part time	3 (23%)	4 (33%)
Full time	6 (46%)	8 (66%)
Smoker (yes/no)	6 (50%)	0 (0%)*

Example table:

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What not to do!

Remove grid lines!

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
Age (yrs)	45 ± 5	36 ± 6*
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Smoker (yes/no)	6 (50%)	0 (0%)*

What not to do!

Make sure everything lines up and looks professional!

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
age (yrs)	45 ± 5	36 ± 6*
female	11 (85%)	10 (83%)
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Smoker (yes/no)	6 (50%)	0 (0%)*

What not to do!

Use a reasonable number of significant figures.

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
Age (yrs)	45.076 ± 5.032	36.007 ± 6.032*
Female	11 (85%)	10 (83%)
BMI (kg/m^2)	21.223 ± 6.332	23.331 ± 3.333
Systolic BP (mmHg)	140.23 ± 10.23	120.23 ± 9.23*
Exercise (min/day)	30.244 ± 20.345	60.123 ± 30.32*
Employment status		
Unemployed	4 (31%)	0 (0%)
Part time	3 (23%)	4 (33%)
Full time	6 (46%)	8 (66%)
Smoker (yes/no)	6 (50%)	0 (0%)*

What not to do!

Give units!

Table 1. Descriptive characteristics of the study groups, means ± SD or N (%).

Characteristic	Bad Witches	Good Witches
N	13	12
age	45 ± 5	36 ± 6*
female	11 (85%)	10 (83%)
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Systolic BP	140 ± 10	120 ± 9*
Exercise	30 ± 20	60 ± 30*
Employment status		
Unemployed	4 (31%)	0 (0%)
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Smoking	6 (50%)	0 (0%)*

Types of Figures

1. Primary evidence
    - photographs, videos, a photo of a laser scanner etc.
    - indicates data quality
    - "Seeing is believing"
2. Graphs
    - line graphs, bar graphs, scatter plots, histograms, boxplots, etc.
3. Drawings and diagrams
    - illustrate an experimental set-up or work-flow
    - indicate flow of participants
    - illustrate cause and effect relationships or cycles

Figure Legends

**Allows the figure to stand alone.

May contain:

1. Brief title
2. Essential experimental details
3. Definitions of symbols or line/bar patterns
4. Explanation of panels (A,B,C,D, etc.)
5. Statistical information (tests used, p-values)

Example Legend

- Fig. 5. Trajectory tracking around a round-about in Versailles : (a) The trajectory shown in white has been superimposed on a satellite image and it can be seen visually that the trajectory aligns with the four corners of the round-about (4 points are required to estimate the pose). The length of the path is approximately 392m taken in 698 images. The maximum inter-frame displacement was 1.78m and the maximum inter-frame rotation was 2.23o (b and c) several occlusions which occurred during the sequence and image 300 and 366 respectively (on the right side of the round-about).

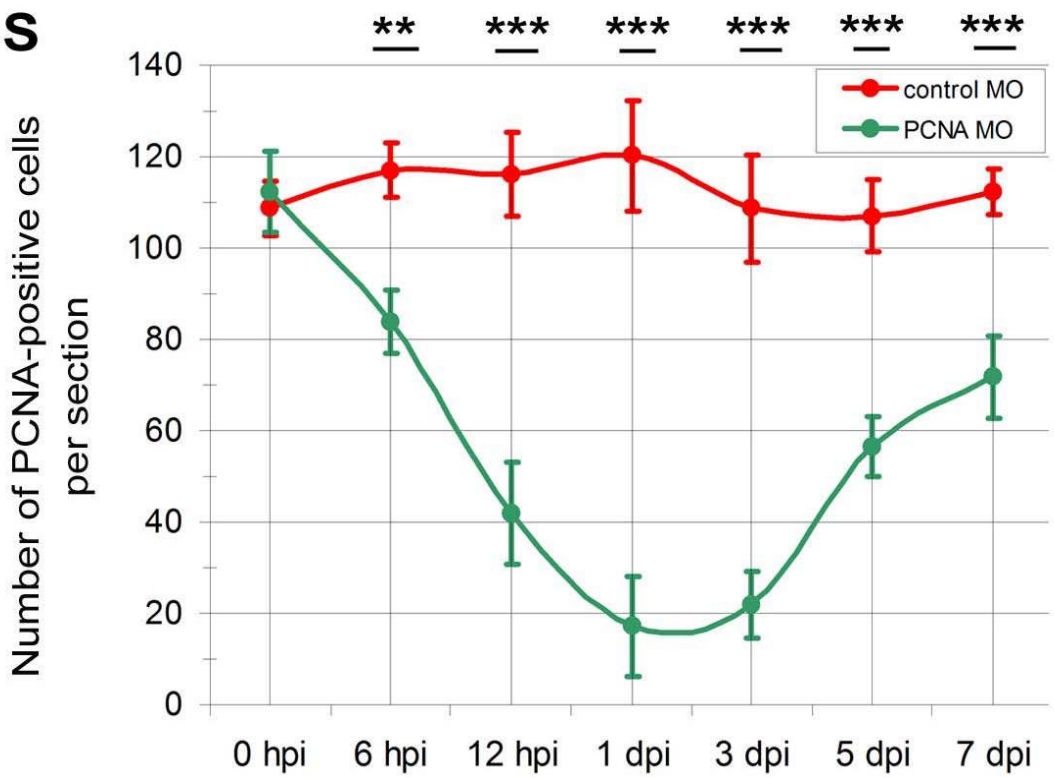
Primary Evidence

Graphs

- line graphs
- scatter plots
- bar graphs
- individual-value bar graphs
- histograms
- box plots
- survival curves

Line Graphs

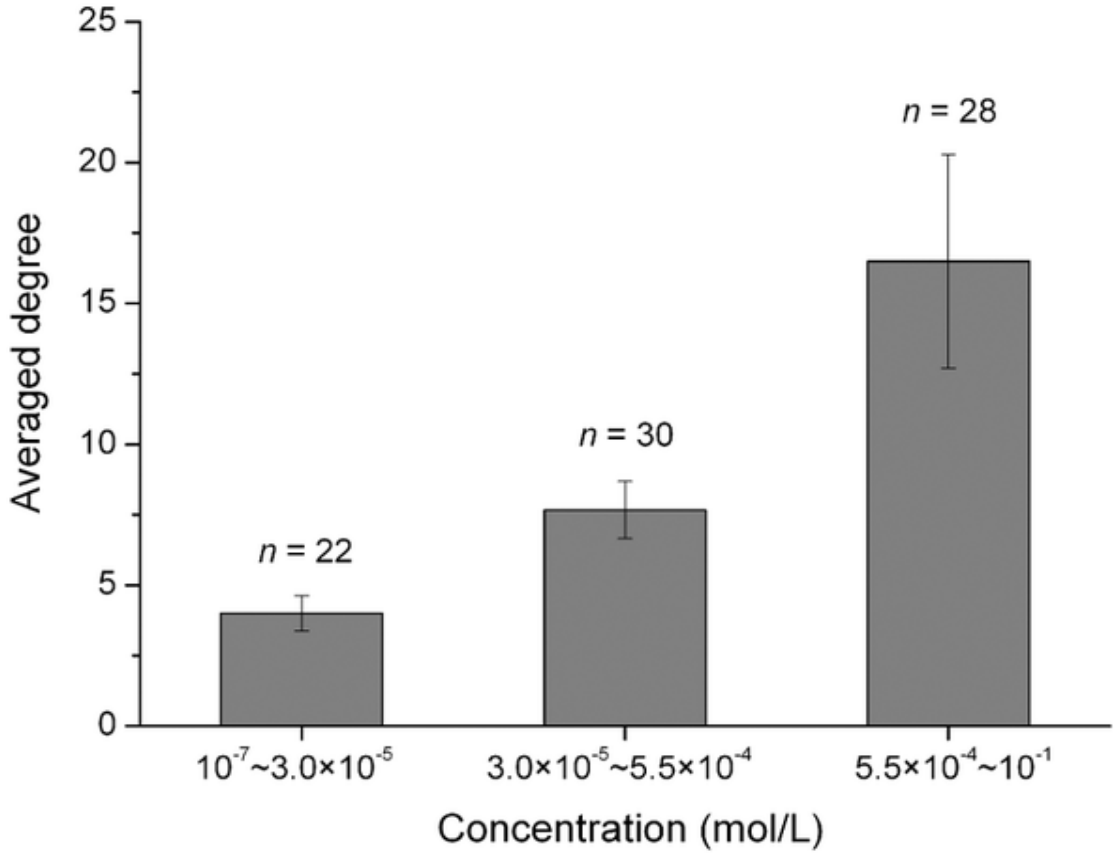
*Used to show trends over time, such as error signals



Bar Graphs

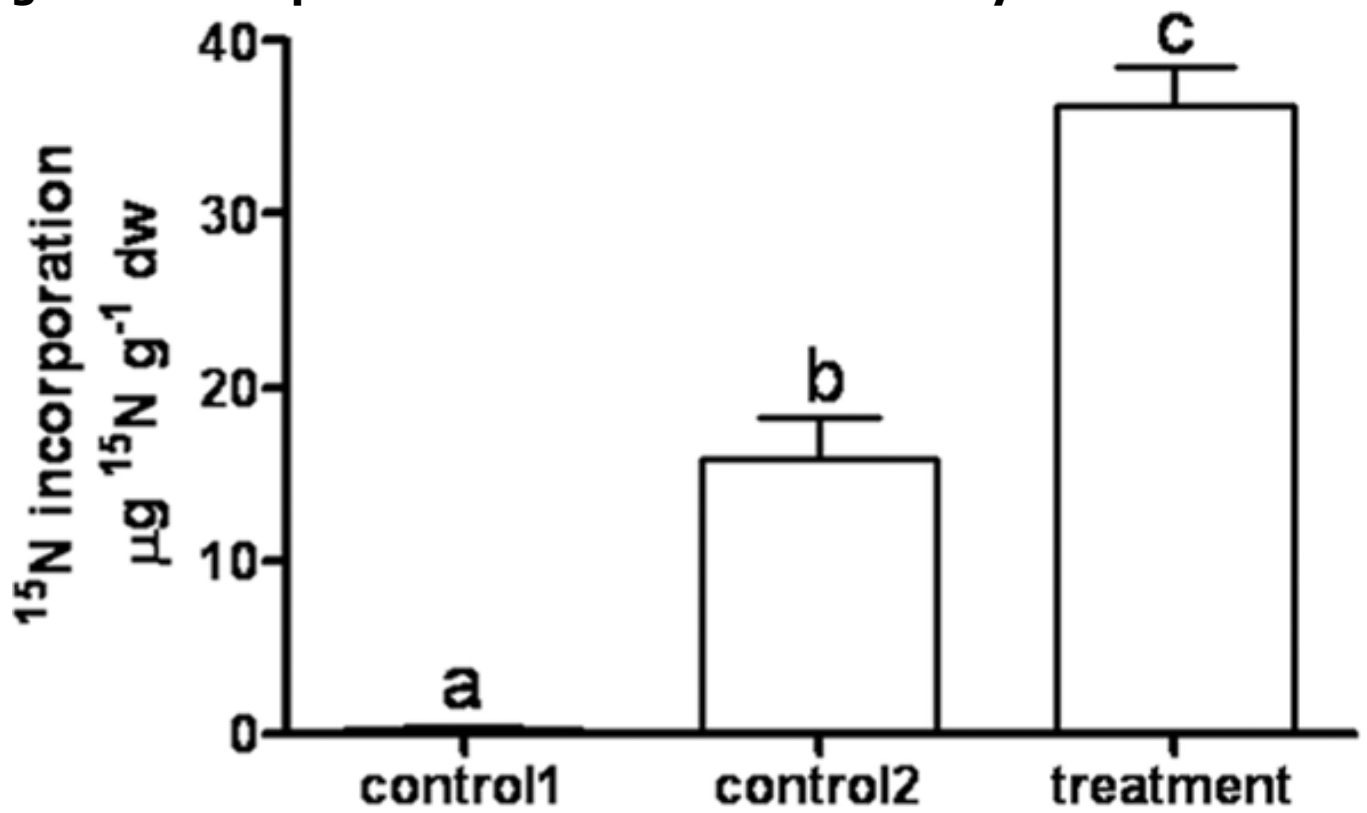
*Used to compare groups at one time point

*Tells a quick visual story



Bar graph

- **Figure 6. Incorporation of E. coli-derived 15N by leaves of tomato plants.**

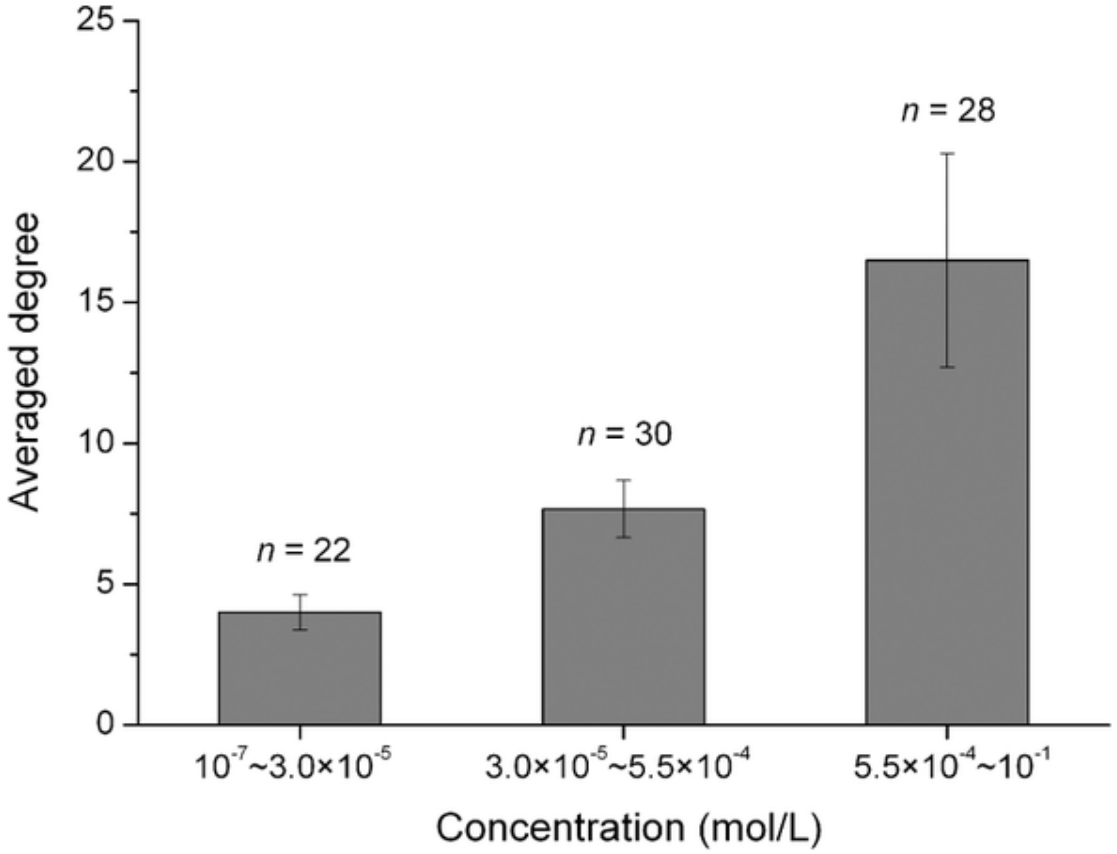


Paungfoo-Lonhienne C, Rentsch D, Robatzek S, Webb RI, et al. (2010) Turning the Table: Plants Consume Microbes as a Source of Nutrients. PLoS ONE 5(7): e11915. doi:10.1371/journal.pone.0011915

PLoS one

Bar graph

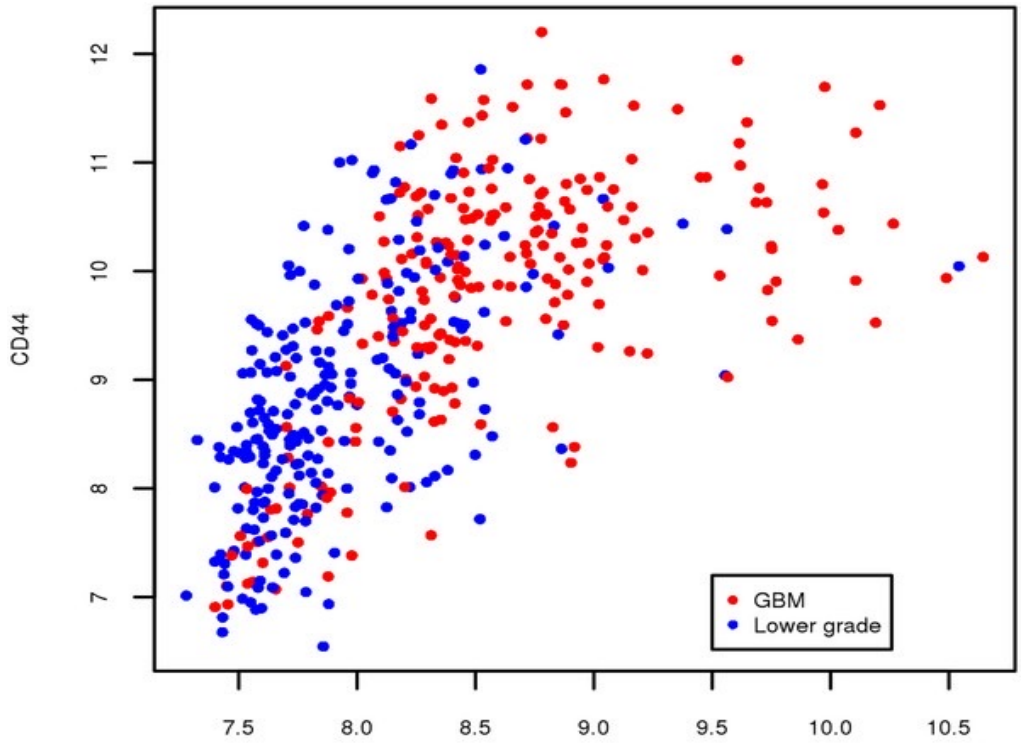
Figure 3. Degree-concentration correlation for E. coli metabolites (P<.01, Kruskal-Wallis test).



Zhu Q, Qin T, Jiang Y-Y, Ji C, et al. (2011) Chemical Basis of Metabolic Network Organization. PLoS Comput Biol 7(10): e1002214. doi:10.1371/journal.pcbi.1002214
http://www.ploscompbiol.org/article/info:doi/10.1371/journal.pcbi.1002214

Scatter Plots

- *Used to show relationships between two variables (particularly linear correlation)
- *Allows reader to see individual data points=more information!

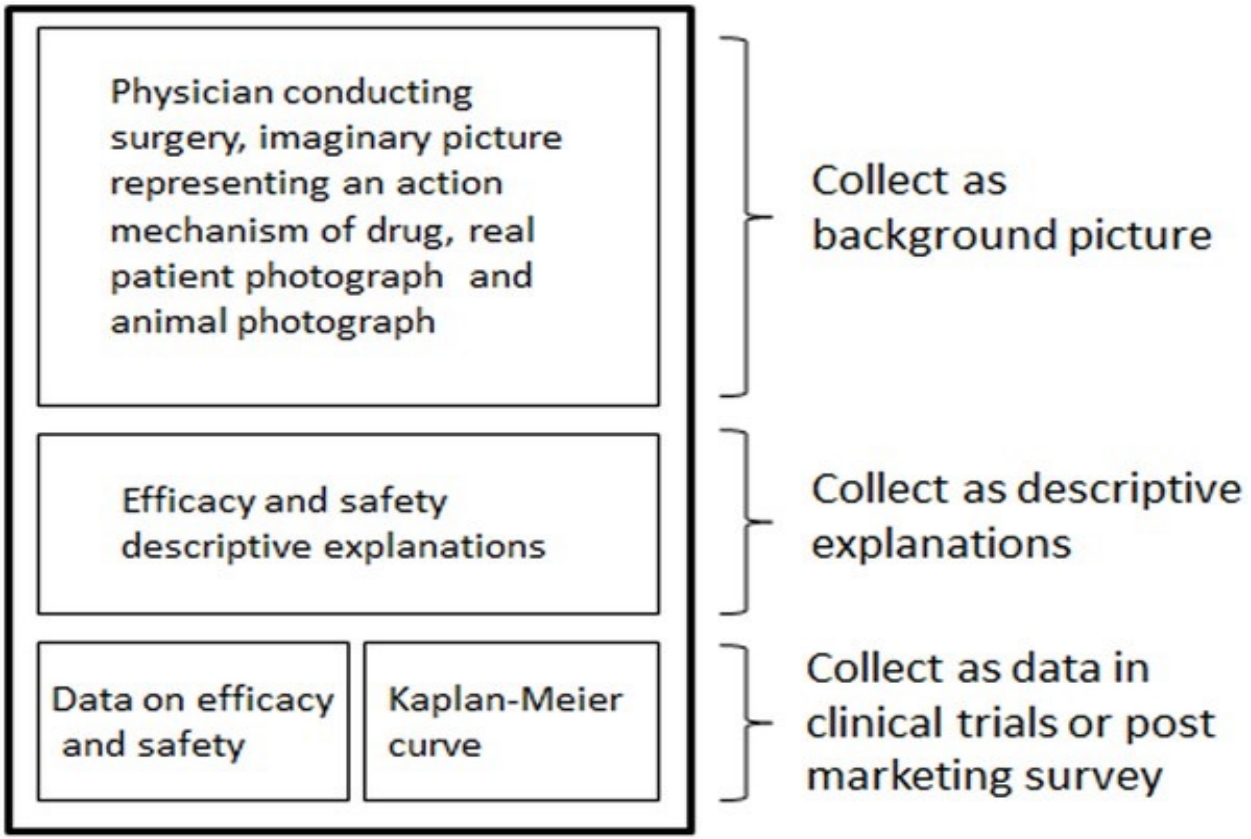


Tips for Graphs

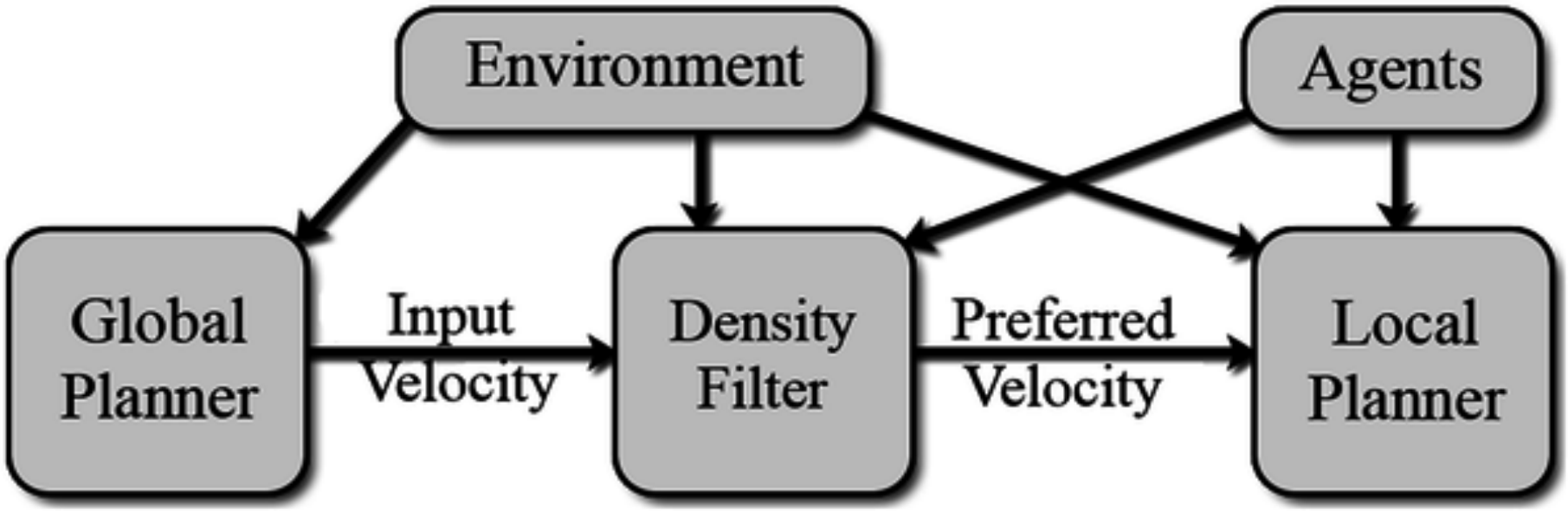
- Tell a quick visual story
- Keep it simple!
- Make it easy to distinguish groups (e.g., different colours, dashed/solid lines)
- If it’s too complex, maybe it belongs in a table

Diagrams and Drawings

- illustrate an experimental set-up or work-flow
- indicate flow of mathematical process
- illustrate cause and effect relationships or cycles



An example of the causal diagrams



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!